Five-Year Review Report

Second Five-Year Review Report

for

Fadrowski Drum Disposal Site

Franklin

Milwaukee County, Wisconsin

September, 2003

PREPARED BY:

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Chicago, Illinois

Approved by:

Date:

William E. Muno, Director
Superfund Division

9/25/03

Operation and maintenance activities have been effective and are ongoing as prescribed in the RA Statement of Work. This includes groundwater and leachate monitoring until such time as the data indicate it is no longer necessary. Evaluation of the effectiveness of the remedy will continue during future five-year reviews until contamination and/or its associated risks are no longer present in the Site groundwater.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name *(from WasteLAN)*: Fadrowski Drum Disposal Site		
EPA ID *(from WasteLAN)*: WID980901227		
Region: 5	**State:** WI	**City/County:** Franklin, Milwaukee County

SITE STATUS	
NPL status: ☒ Final ☐ Deleted ☐ Other (specify)	
Remediation status (choose all that apply) ☐ Under Construction ☐ Operating ☒ Complete	
Multiple OUs?* ☐ YES ☒ NO	**Construction completion date:** 8 /28 /1995
Has site been put into reuse? ☐ YES ☒ NO	

REVIEW STATUS	
Lead agency: ☒ EPA ☐ State ☐ Tribe ☐ Other Federal Agency	
Author name: Sheila A. Sullivan	
Author title: Remedial Project Manager	**Author affiliation:** U S EPA, Region 5
Review period:** 9 /14 /1998 to 9 /14 /2003	
Date(s) of site inspection: 9 / 10 / 2003	
Type of review: ☒ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only ☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead ☐ Regional Discretion	
Review number: ☐ 1 (first) ☒ 2 (second) ☐ 3 (third) ☐ Other (specify)	
Triggering action: ☐ Actual RA Onsite Construction at OU #____ ☐ Actual RA Start at OU#____ ☐ Construction Completion ☒ Previous Five-Year Review Report ☐ Other (specify)	
Triggering action date *(from WasteLAN)*: 9/14/1998	
Due date *(five years after triggering action date)*: 9/14/2003	

* ["OU" refers to operable unit]
** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN]

Five-Year Review Summary Form, cont'd.

Issues:

Three issues were identified during the September 10, 2003 inspection:

1) The cap and casing of Monitoring Well 8D must be adjusted so that they contact properly. Currently there is a one-inch gap in closure due to casing settlement.

2) Additional signs need to be posted along the Site perimeter fence. The current signs are not posted within the required 200-ft intervals and are too faded to see or read easily.

3) The barbed wire topping on a portion of the chain-link fence needs to be fixed and tightened.

Recommendations and Follow-up Actions:

1) The monitoring well cap must be pulled up and the well casing must be adjusted so that proper well closure is achieved. The casing must then be re-cemented properly into the ground. If these adjustments are not possible, the casing will have to be cut off and the pump will need to be pulled in order for the casing to be installed properly.

2) In the short-term (by 9/30/03, 12 additional "No Trespassing" signs will be posted along the perimeter fence (three additional signs on each side of the Site). When the Site is deleted within the next few months, EPA and WDNR will make up new signs reflecting the status of the Site and the appropriate Agency contact information. These will be posted at the Site.

3) The barbed wire will be tightened.

Protectiveness Statement(s):

Because the site-wide remedial action is protective, the site is protective of human health and the environment. All data and observations collected and evaluated during this Review indicate that the remedy is functioning as intended by the ROD and is expected to continue in this manner. The FDDS neither poses a threat to human health or the environment, nor is it expected to in the future. The effectiveness of the remedy has been tracked through the monitoring program, which has been ongoing for the past eight years and will continue in the future.

Other Comments:

None

Five-Year Review Report

I. Introduction

The purpose of five-year reviews is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of such reviews are documented in the site-specific five-year review reports. In addition, five- year review reports identify issues or deficiencies, if any, found during the review process for the site, and provide recommendations to address or correct them.

The United States Environmental Protection Agency (EPA) is preparing this site-wide five-year review pursuant to CERCLA § 121 and the National Contingency Plan (NCP). CERCLA § 121 states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The EPA interpreted this requirement further in the National Contingency Plan (NCP); 40 CFR § 300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

The EPA, Region 5 has conducted a site-wide five-year review of the remedial action (RA) implemented at the Fadrowski Drum Disposal Site (FDDS) in Franklin, Wisconsin. This review was conducted for this Site from January 2003 through September 2003 by the EPA Remedial Project Manager (RPM), with assistance from the Wisconsin Department of Natural Resources (WDNR) Southeast Region Office Site Manager. This report documents the results of the review. As part of this review, the RPM reviewed all data collected under the regular monitoring under operation and maintenance (O&M) for the Site to evaluate the current Site status.

This is the second such site-wide five-year review for the FDDS. The first five-year review was completed on September 14, 1998; the triggering action for that statutory review was the start of the onsite RA construction activities on September 7, 1993, as documented by EPA's WasteLAN database. EPA's policy changes consecutive reviews re-set the due date for this second review to five years from the completion date of the first review. Hence, the due date is September 14, 2003. This statutory five-year review was specifically activated by the presence of hazardous substances, pollutants and contaminants remaining at the Site above levels that allow for unlimited use and unrestricted exposure.

II. Site Chronology

TABLE 1 - CHRONOLOGY OF SITE EVENTS

Event	Date
Site operated as unlicensed disposal facility	1970 to 1982
WDNR discovers the disposal of nonexempt wastes during a Site investigation	February 1981
Menard, Inc purchases the Site from Edward Fadrowski	December 1982
Buried and ruptured drums uncovered during Site soil excavation	May 1983
WDNR testing indicates that the drummed and released wastes are hazardous	1983
Site proposed for National Priority (NPL) List	October 15, 1984
Site finalized on NPL	June 10, 1986
Administrative Order by Consent signed between PRPs, EPA and WDNR compelling PRPs to conduct the Remedial Investigation/ Feasibility Study (RI/FS)	May 11, 1987
RI/FS undertaken	April 17, 1987 to May 22, 1991
Record of Decision signed	June 10, 1991
AOC signed between PRPs, EPA and WDNR compelling PRPs to conduct Remedial Design/Remedial Action (RD/RA)	September 30, 1991
Cooperative Agreement signed between EPA and WDNR to fund state oversight of the RD/RA	September 1991
RD completed	January 1993
EPA and WDNR approve RD	March 17, 1993
Unilateral Administrative Order issued by EPA directing PRPs to perform RA	April 21, 1993
Actual RA start	September 7, 1993
IA field activities completed	September 1994
Certification of Construction Completion	March 24, 1995
Preliminary Closeout Report signed signifying construction completion	August 28, 1995
1st Five-Year Review Completed	September 14, 1998
EPA and WDNR approve reduced Site monitoring	November 2000
EPA modifies original deed restriction boundary	December 2000
Public notification of 2nd Five-Year Review	January 8, 2003
Final Close-out Report signed	August 6, 2003
2nd Five-Year Review Site Inspection	September 10, 2003
Site Deletion from NPL	In Progress

III. Background

Physical Characteristics

The FDDS occupies approximately 20 acres of suburban land in the southeast quarter of Section 1, Township 5 North, Range 21 East, in the City of Franklin, Milwaukee County, Wisconsin. The City of Franklin is located just outside of the Milwaukee city limits. The Site is fronted by U. S. 41 (also known as South 27th Street) on the east, Rawson Avenue is about 1,400 feet to the south and College Avenue is located approximately 3,400 feet to the North. An unnamed tributary flows southward along the western boundary of the Site and eventually empties into the Root River approximately three miles southwest of the Site (see Figures 1-2). The tributary carries overflow water from Mud Lake in Grobschmidt Park, approximately one-quarter mile north of the Site, and also receives storm water discharge from South 27th Street and other upgradient paved areas.

Land Resource and Use

The Site abuts and is downgradient of the defunct Menard lumber and retail facility located directly to the north. Several commercial retail facilities are situated directly south and southwest of the Site. The new Menard Home Improvement Center is located east of the Site, across U.S. 41. Residential subdivisions and multi-unit residential properties are situated west of the unnamed tributary, along Rawson and Drexel Avenues (see Figures 3-4).

There is considerable development of small businesses and homes along South 27th Street. About one-quarter mile north of the FDDS, along South 27th Street, a large residential development is situated on the east side of the street and a trailer park on the west side of street. Several residences with private wells are within 2,000 feet of the Site. The closest private well was at the Gilbert Puetz residence, which was adjacent to the southeast Site boundary (6881 S. 27th Street). This well was 245 feet deep and cased to the top of the dolomite bedrock aquifer. The property has since been sold to a commercial developer and is no longer used residentially. The Ballotta residential well was located at 3330 W. Rawson Avenue, downgradient of the Site. This well was used as a groundwater monitoring location. The residence has since been demolished and the well abandoned accordingly.

Several municipal wells for the cities of Franklin and Oak Creek are within three miles of the FDDS. These wells range from 350 to 1,500 feet deep and are cased to the top of the dolomite bedrock. The closest municipal well is a back-up well for the City of Oak Creek and is located about one-quarter mile north of the Site on South 27th Street. This well also draws from the dolomite aquifer. However, drinking water from these groundwater sources has not been impacted from the contamination at the Site.

Grobschmidt Park is considered an environmentally significant area by the City of Franklin, and is also classified as a wetland by the WDNR and the Southeast Wisconsin Regional Planning Commission (SEWRPC). The unnamed tributary west of the Site and the small wooded area along the stream southwest of the Site are listed as a secondary environmental corridor by the City; however, only the wooded area southwest of the FDDS is listed as a wetland by WDNR and SEWRPC.

History of Contamination

Between 1970 and 1982, the FDDS was owned and operated by Edward J. Fadrowski as an unlicensed disposal facility that accepted demolition and construction wastes. Pursuant to applicable state regulations, the operation would have been exempt from regulation had it only accepted solid waste consisting of clean earth fill and containing less than 25 percent demolition waste. During the same time frame, Mr. Fadrowski was also the principal operator of a waste collection and transportation company called Ed's Masonry & Trucking (Ed's Trucking) which was licensed to collect and transport noncombustible waste, wood,

refuse and garbage. The clients of Ed's Trucking included a wide variety of local businesses and industries which generated a variety of wastes.

The WDNR discovered the unlicensed disposal of non-exempt waste at the Site in February 1981 during a site inspection and warned Fadrowski against disposing of regulated hazardous waste at the FDDS. After receiving information in July 1981 from a former employee of Ed's Trucking that substantial amounts of nonexempt solid and possibly hazardous waste were being disposed of at the Site, WDNR subsequently inspected the Site and found that the disposal of metal, wood, foundry waste, crushed drums and slag-type boiler waste had occurred at the Site. However there was no specific evidence of hazardous waste disposal.

Later in 1981, the City of Franklin requested that Mr. Fadrowski provide a schedule for bringing the FDDS into compliance with the City code. Mr. Fadrowski did not comply and the FDDS continued operating as an unlicensed and uncontrolled landfill. Reports indicate that Fadrowski accepted waste oil sludges, foundry sand, contaminated soils from underground storage tank removals, household waste, miscellaneous commercial waste and containerized liquids and semisolids.

On January 5, 1983, Menard, Inc. of Eau Claire, Wisconsin purchased the FDDS property and two adjacent land parcels to the north to construct a lumber and retail facility (Menard Cashway Lumber Store) at 6801 S. 27th Street. The FDDS property was intended as a source of borrow soil to be used during the grading and construction of Menard's lumber and retail facility on the adjacent parcels. During excavation at the Site for soil fill material from May through June 1983, buried drums containing unknown liquids and sludges were uncovered; some of the drums had been ruptured, releasing their contents. The WDNR conducted sampling of the drum contents and found them to be hazardous, as defined by Chapter NR 181 of the Wisconsin Administrative Code (WAC). The samples revealed high concentrations of lead at 32,700 parts per million (ppm) and chromium at 6,800 ppm. Also identified were trace levels of arsenic (less than 5 ppm), the pesticide DDT at 1,450 ppm, and various petroleum-derived volatile organic compounds (VOCs). Ignitabilty test results for the other waste samples collected by WDNR at the Site were found to be hazardous because their flash points were below 140 degrees Fahrenheit.

The EPA Office of Health and Environmental Assessment determined that the carcinogenic risks from the principal threat, i.e., buried containerized wastes, exceeded the upper threshold of acceptable carcinogenic risk (1xl0-4). The EPA and the WDNR believe that a number of potential responsible parties (PRPs) generated the hazardous wastes that were disposed of at the Site and/or caused the release of these substances at the Site.

Initial Response Actions

A Potential Hazardous Waste Site Preliminary Assessment was prepared for the FDDS by the WDNR contractor Ecology & Environment (E&E) on January 11, 1984. The report concluded that the containerized waste and sludge at the Site was a potential source of contamination to surface water and groundwater. A second Potential Hazardous Waste Site Report involving sampling was prepared by E&E on behalf of WDNR in April 1985. The FDDS was proposed for listing on the National Priority List (NPL) on October 15, 1984 and was placed on the NPL on June 6, 1986. There were no other pre-Remedial response actions taken at the Site, such as a removal or similar activities.

An Administrative Order by Consent (AOC) was signed on May 11, 1987 by the PRPs, U.S. EPA and WDNR, compelling the PRPs to conduct a Remedial Investigation and Feasibility Study (RI/FS) at the Site. The draft RI/FS was completed by INX International Ink Company (INX), formerly ACME Ink Printing Company of Milwaukee, Wisconsin in March 1991. The final FS was completed in June 1991 and provided an in-depth summary and discussion of sampling activities, a risk assessment and an analysis of remedial alternatives.

Basis for Taking Action

As per the May 1987 AOC Statement of Work (SOW) for the RI/FS, the RI included a full characterization of the chemical wastes at the Site, definition of contaminant sources, determination of the vertical and horizontal extent of contamination, identification of contaminant migration pathways and movement, and the assessment of public health and environmental risk. This involved performing a Site geophysical investigation (electromagnetic and magnetometer surveys), investigating the Site hydrogeology, soil, sediments, surface water and air. The results of the RI investigations are briefly summarized by media as follows.

Groundwater

The groundwater investigation involved the installation of five water table wells and three piezometers in nested arrangements at the four corners of the landfill. The RI determined that groundwater flows in a different direction within each of the geologic units. In the uppermost clay aquifer groundwater flows north to northwesterly; in the sand and gravel aquifer, the groundwater flows eastward toward Lake Michigan and in the deeper dolomite bedrock aquifer, the flow component is south to southwest. These units are hydraulically connected. The RI results confirmed that the groundwater in the clay till had been impacted by cyanide, chromium and barium in excess of the Wisconsin Preventive Action Limits (PALs), and mercury was found in excess of the Wisconsin Enforcement Standard (ES). There are several private wells located within 2000 feet of the Site and several municipal back up wells for the cities of Franklin and Oak Creek Seated within three miles of the Site; however, testing showed that drinking water from these groundwater sources has not been impacted by the Site. Lake Michigan is the municipal water supply source for the cities of Oak Creek and Franklin. The City of Franklin purchases its water from the City of Oak Creek. The major groundwater contaminants of concern to human health at the FDDS were the following:

Benzene
Mercury
Cyanide

Surface Water

The surface water investigation was to evaluate surface water as a contaminant migration pathway. The surface water onsite was contained by a large manmade pond approximately 360 feet long by 120 feet wide. The pond, created during the excavation of borrow fill material for the construction of the Menard facility, is located in the west central portion of the Site. The pond intercepted most surface water runoff over the Site and was also a point of ground water discharge. The pond contained elevated cyanide levels. The water in the unnamed tributary along the western Site boundary was found to contain low levels of VOCs. Other contaminants detected in the tributary downstream of the Site, namely ethylbenzene and xylenes, were not detected onsite. Cyanide and mercury were detected in tributary samples collected both upstream and downstream of the Site, and were therefore not likely to be site-related. No semivolatile organic chemicals (SVOCs) were detected in the tributary surface water. The major contaminants of concern to human health were the following:

Aluminum	(pond only)
Arsenic	(pond only)
Potassium	(pond only)
Cyanide	(pond and tributary)

Sediments

The sediments sampled in the onsite pond contained site-related contaminants. Sediments collected downstream of the Site in the unnamed tributary showed higher concentrations of certain polynuclear aromatic hydrocarbons (PAHs) than did the upstream samples. Similarly,

total PAHs and inorganics including aluminum, barium, beryllium, calcium, lead and magnesium showed higher concentrations in the downstream samples compared to the samples collected upstream of the Site, indicating the tributary sediments may have been impacted by the Site. The major contaminants of concern to human health were the following:

Toluene
Acetone
Fluoranthene
Pyrene
Butylbenzylphthalate

Site Soils

Surface soils from the western slope of the fill pile showed PAH concentrations as high as 10,290 ppb. This finding was consistent with the character of onsite subsurface soils, and indicated that runoff or seeps from the fill pile were impacting surface soils that were both adjacent to and west of the fill pile. Subsurface soils collected from onsite were contaminated with organic compounds, namely toluene at levels ranging from 34 to 1,800 parts per billion (ppb). Total PAHs were also frequently detected in the subsurface soil at levels as high as 24,300 ppb. The subsurface soil borings revealed DDT at its highest concentration of 310 ppb and the PCB Arochlor 1254 at a maximum concentration of 1,900 ppb. Cyanide was found in one boring at 6,360 ppb and numerous inorganic compounds were also detected. The major contaminants of concern to human health included:

Arochlor 1248	Fluoranthene	Dibenzofuran	PCE	Lead
Arochlor 1254	Phenanthrene	Benzene	1,1,1-TCA	Magnesium
a-chlordane	Pyrene	Ethylbenzene	TCE	Mercury
y-chlordane	Butylbenzylphthalate	Toluene	Phenol	Nickel
4,4-DDT	Di-n-butylphthalate	Xylenes	Cadmium	Zinc
Benzo(k)fluoranthene	Bis(2-ethylhexyl) phthalate		1,1-DCA	Cyanide

Risk Assessment

The risk assessment concluded that people may have been exposed to hazardous substances through drinking contaminated groundwater and surface water or by accidentally ingesting contaminated soil. Local residents in the area around the Site, especially children, potentially use the onsite pond located at the eastern edge of the Site for swimming, thereby exposing themselves to Site contaminants. The risks to human health calculated from the low level contamination found in the soils, sediment, surface water and groundwater were within the 1xl0-4 to 1xl0-6 risk range for carcinogens that is generally considered acceptable by EPA. However, the risk assessment did not factor in the presence of the containerized waste at the Site -- a site-specific condition which posed the principal health threat. Buried drums onsite posed a threat if the Site were to be developed in the future since the drums degrade over time, releasing their contents. Some of the drums had already ruptured and further contaminated the environment. EPA estimated that the carcinogenic risk from direct contact with containerized waste at the Site exceeded the high end of the acceptable risk range, 1xl0-4, and the noncarcinogenic risk exceeded the hazard index of 1.0, the upper limit of the acceptable noncarcinogenic risk range.

IV. Remedial Actions

Remedy Selection

Six cleanup alternatives were evaluated during the Feasibility Study (FS). Based on the contaminant levels detected in the groundwater and the limited extent of groundwater contamination, no groundwater alternatives were among the six alternatives evaluated. The alternatives which were considered consisted of source-control actions that relied on natural attenuation of groundwater contaminants.

On June 10, 1991, consistent with the Remedy Delegation Report of March 8, 1985, the Regional Administrator approved the ROD, with the full concurrence from the WDNR. The remedial action objectives (RAOs) were to eliminate or reduce migration of the contaminants from the Site to the groundwater and to reduce the risk associated with exposure to the contaminated materials, thus protecting human health and environment. The major components of the selected remedy included:

- Excavation of previously identified drums and associated characteristically hazardous soils;

- Construction of trenches to find and excavate additional containerized waste and associated characteristically hazardous soils;

- Off-site recycling or treatment and disposal of drummed wastes

- Off-site treatment and disposal of contaminated soil;

- Construction of a landfill cover (cap) in compliance with Chapter NR 504.07, WAC landfill closure requirements;

- Use of institutional controls on landfill property to restrict future land and groundwater use and to prohibit future development of the Site within the Waste Management Boundary;

- Monitoring of groundwater, surface water and sediment to ensure the effectiveness of the remedial action (RA), i.e., the achievement of PALs where technically and economically feasible, and to evaluate the need for future groundwater treatment.

Remedy Implementation

On September 30, 1991, EPA and Menard, Inc., a PRP and current owner of the Site, entered into an AOC to perform the Remedial Design (RD). In September 1991, a Cooperative Agreement was signed between EPA and WDNR (the "Agencies") that provided federal Superfund enforcement funds to WDNR in support of state oversight activities during the RD/RA phases. These resources were matched at a ten percent level by the State.

A draft RD Report was submitted by Menard's contractor, Ayres Associates of Eau Claire, Wisconsin in January 1993. The final RD Report containing the Construction Quality Assurance Plan (CQAP), was reviewed by EPA and WDNR in compliance with all requirements of the ROD and applicable quality assurance/quality control (QA/QC) procedures and protocol. The EPA in consultation with WDNR granted conditional approval on the PRP-lead final RD on March 17, 1993. The CQAP was approved in August 1993 and was adhered to throughout all RA activities. All sample collection activities at the Site were conducted in accordance with EPA protocols. Details of the analytical procedures and methods utilized were included in the site-specific final quality assurance project plan (QAPP) which was approved by EPA. The QAPP is consistent with the requirements of EPA's Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans (QAMS-005/80), more recently superseded by EPA QA/R-5 (November 1999).

The RD components included:

- Restricting Site access by installing fencing and implementing institutional controls;
- Outlining procedures to remove drummed waste and contaminated soil from Site locations;
- Design of a leachate collection system to collect and monitor leachate;
- Design of a multilayer, low-permeability landfill cover which conforms to WAC Chapter NR 504.07;
- Design and siting of additional groundwater monitoring wells; and
- Design of a groundwater, surface water, and leachate monitoring program.

On February 18, 1993, EPA held a public meeting to present the pending cleanup activities to the residents of Franklin, Wisconsin. EPA issued a Unilateral Administrative Order (UAO) to the PRPs on April 21, 1993, requiring them to perform the RA activities. The UAO included the scope and preliminary schedule of work to be completed as part of the RA. In a letter dated May 21, 1993, the Responding Parties (RPs) notified EPA of their intent to complete the RA in accordance with the UAO. On June 4, 1993, the RP, Menard, Inc., retained Ayres Associates, Inc. of Eau Claire, Wisconsin to provide project coordination and construction quality assurance services for the RA. Warzyn Engineering Inc., which later merged with Montgomery Watson, was subsequently retained by the RPs on September 2, 1993 as the primary construction contractor to execute the RA at the Site.

The RA field activities began on September 7, 1993, the trigger date for the first statutory five-year review for the Site. Construction activities were completed on August 28, 1994, as signified by the PCOR and included:

- Removal of 167 buried drums;
- Excavation of approximately 100 cubic yards of impacted soils;
- De-watering and backfilling the 2.6 million gallon onsite pond;
- Consolidation of over 18,000 cubic yards of waste (primarily demolition debris) in order to minimize the capped area;
- Installation of a multi-layered soil cover system over areas known to contain waste and a leachate collection system;
- Installation of a perimeter fence; and
- Installation of both upgradient and downgradient nested monitoring wells which were screened within the three geological units (clay, sand and gravel, and dolomite bedrock) at the Site.

During the course of the project, EPA utilized two oversight contractors, Metcalf & Eddy and Black & Veatch. In addition to EPA, WDNR also provided regulatory oversight. The QA/QC program utilized throughout the RA was sufficiently rigorous, and enabled the agencies to determine that all analytical results were accurate to the degree needed to assure satisfactory execution of the RA according to the ROD and RD plans and specifications.

The contract for the RA detailed a rigorous sampling and analysis program. Specifically, sampling was required and implemented to: 1) Protect the off-site public, 2) protect the onsite workers, and confirm that the RA objectives had been achieved. The sampling program included air monitoring during RA activities and was conducted hourly for explosive gas concentrations, organic vapors and particulates. Excavation and soil boring areas was monitored continuously for explosive vapors. Breathing areas in the various work zones were also monitored hourly for organic vapors and particulates.

The RA objectives included: treating the principal threat (containerized waste) to the extent practicable; reducing the threat of direct contact with the waste; reducing the infiltration of water into the waste to prevent further groundwater contamination; reducing contamination of the surface water (pond and unnamed tributary) onsite; and, achieving groundwater PALs where technically and economically feasible. The achievement of these RA objectives for the pond closure was confirmed by:

- Confirmatory sampling of the pond base sediment and sub-sediment soils to verify contaminant removal prior to backfilling;
- Testing the physical characteristics of the pond backfill soil from the Emerald Park Landfill, located about eight miles southwest of the FDDS to determine its suitability.

The achievement of RA objectives for landfill waste grading and consolidation was confirmed by:

- Sampling of the sub-waste soil to determine the presence of cyanide.

The achievement of RA objectives for the leachate collection system was confirmed by:

- Sampling of soils to define the edge of waste and to appropriately locate the leachate collection line;

- Pore water samples were collected and analyzed for metals, pesticides/PCBs and semivolatiles.

The achievement of RA objectives for the landfill cover system was confirmed by:

- Geotechnical and physical testing of the clay borrow source material, also from Emerald Park, to determine its suitability prior to being used.

The achievement of RA objectives for the groundwater was confirmed by:

- Quarterly monitoring for the first two years post-RA completion followed by semi-annual monitoring for three years; this comprised 15 monitoring events during which groundwater constituents were tracked with respect to PALs.

- Statistical analyses of comprehensive groundwater data at two years and five years post-RA to ascertain whether the PALs were being achieved. As part of the analyses, background groundwater quality was evaluated for three constituents (iron, fluoride and manganese) that continued to exceed PALs in onsite wells. Background levels for these elements were found to be consistent with onsite levels, indicating the technical and economic impracticability of achieving PALs for these constituents.

The Agencies conducted a final inspection of the FDDS on February 2, 1995, during which time some remaining action items were identified. A Remedial Action Construction Completion (RACC) Report was submitted to EPA by the RPs on March 24, 1995, certifying that the RA activities had been completed according to the project design and specifications. The remaining action items included the restoration of areas disturbed during monitoring well installation and the commencement of leachate discharge. The scope and schedule for this work were submitted to EPA in a subsequent correspondence. The documentation of the monitoring well installation and a revised operation and maintenance (O&M) plan were to be submitted to EPA as an addendum.

On June 26, 1995, EPA in concurrence with WDNR, granted conditional approval on the RACC Report. Addendum No. l to the Report was submitted by the RPs to EPA on July 13, 1995. EPA provided comments on the Addendum to the RPs on August 18, 1995. The groundwater monitoring well installation documentation was completed in September 1995 and the revised O&M report was completed m November 1995.

All construction activities have been completed and the Site poses no apparent public health hazard. It is anticipated that groundwater will meet the RA clean-up standards through natural attenuation. The statement of work (SOW) required that after two years and five years of respective monitoring, statistical evaluations of the data be performed to determine if the Site is meeting cleanup requirements. Cleanup requirements for the FDDS were set in the 1991 ROD and are based on the PAL values in the Wisconsin 1988 NR 140 Ground Water Quality Standards code. The effectiveness and progress of the remedy has been tracked through the monitoring program. The environmental monitoring data collected following completion of the RA included semiannual sampling of groundwater and leachate for field parameters (temperature, pH, conductivity), EPA target analyte list (TAL) compounds, EPA target compound list (TCL) compounds, WAC Chapter NR 508 parameters (alkalinity, chemical oxygen demand, hardness, sodium, dissolved iron, chloride, and fluoride), percent organic material (stream sediment samples only), and grain size

analysis (stream sediment samples only).

The sampling began in November 1995 and included the nine onsite nested monitoring wells, one private well (Ballotta residence), two surface water/sediment locations and one leachate collection tank location. Fifteen rounds of groundwater and leachate monitoring data, nine rounds of surface water, and seven rounds of sediment monitoring data have been collected. These samples were analyzed for TAL inorganics, TCL organics and water quality parameters. Hazelton Environmental Services, Inc. initially performed the laboratory analyses until the business terminated on March 7, 1997. Quanterra Inc. of Tennessee was subsequently contracted by Ayres, as an approved CLP laboratory, to continue the analytical work for the Site (Quanterra changed its name in 2000 to Severn Trent Laboratories, Inc.). Table 2 lists the monitoring events that have been conducted at the FDDS.

TABLE 2 - MONITORING EVENTS CONDUCTED AT THE FDDS

Year	Surface Water and Sediment *	Ground Water	Leachate
1995	November	November	November
1996	March, August, November	March, August, November	March, August, November
1997	August and November	August and November	August and November
1998	February, May, December	February, May, December	February, May, December
1999	May and November	May and November	May and November
2000	May	May and November	May and November
2001	Not Required	May and November	May and November

* The table implies 12 surface water and sediment events, however 9 surface water and 7 sediment monitoring events were conducted within the 12-event time frame.

In November 2000, after reviewing the two-year statistical groundwater report submitted by the RPs, EPA and WDNR eliminated the surface water monitoring requirement and reduced the number of required monitoring parameters for groundwater, since no impacts from the Site had been detected. The quarterly results have shown that site-related contaminants follow a declining trend in their respective concentrations.

Statistical evaluation of the groundwater data collected over the past 15 monitoring events also indicate that iron, manganese and fluoride have been consistently detected above their respective PALs at the five percent statistical significance level. Although these constituents exceed their PALs, they are also common compounds found naturally in the groundwater of Wisconsin. An evaluation of the background groundwater quality in Milwaukee County indicated that concentrations of fluoride, iron and manganese above the established 1988 Chapter NR 140 PALs are common; hence, the PAL exceedances reported onsite are unlikely to be related to past FDDS activities and more probably reflect naturally occurring groundwater quality at this point in time. This finding indicates that achieving PALs for these three constituents via natural attenuation is not technically or economically feasible; hence, an exemption from the WDNR, allowing the calculation of ACLs for these constituents in the monitoring wells where the PALS are exceeded, was deemed appropriate.

Surface water from the unnamed tributary at the Site has been sampled and analyzed during nine monitoring events at both upgradient and downgradient flow locations with respect to the FDDS. Analytical results indicated that while surface water quality is affected by urban runoff, the results do not reflect that surface water has been impacted by the FDDS.

System Operations/O&M

The Site has been in the O&M phase since August 28, 1995 when the PCOR was completed. The Site owner and RP, Menard, Inc., is conducting O&M activities for the landfill and groundwater monitoring in accordance with Sections VI and VII (par. 45) of the 1993 UAO. This work is being accomplished through its primary RA contractor Ayres Associates. The periodic O&M responsibilities listed in Table 3 and sampling activities in Table 4 have been performed by Ayres' subcontractor, Environmental Sampling Corporation (ESC) of Muskego, Wisconsin. Monthly Field Status Reports, including the compliance and discharge reporting for the MMSD are filed by ESC as per Task IV (A), Section III of the RA SOW. A semiannual inspection report is also prepared by ESC for Ayres Associates. These reports are kept at the ESC, office facility in Muskegon, WI, and at the Ayres offices in Eau Claire, WI. The annual O&M report, filed in June, summarizes the O&M work conducted over the past year, as well as any problems at the Site and the corrective actions taken, and changes in the monitoring and reporting requirements. This report is provided to the Agencies. The O&M items of note that have occurred at the Site are the following:

1. Installation of a shallow subsurface drain system in 1999 to intercept the surface water found seeping from the west slope of the Site. The drain system directed the water via piping to the leachate collection system where it was discharged to the Milwaukee Metropolitan Sanitary District (MMSD). This system eliminated a seep that was detected; no problems with the cover system. have been detected since that time.

2. Miscellaneous repairs to the fencing and access road, as well as annual mowing of the grass cover at the Site; and,

3. Reduction in groundwater and leachate monitoring frequency from quarterly to semi-annually. Surface water and sediment sampling of the unnamed stream were eliminated in 2000 due to the inability to detect site-related contaminants over a two-year period, as documented in the Two-Year Ground Water Assessment Report approved by the Agencies in November 2000.

During the O&M phase, some modifications have occurred around the FDDS. Deed restrictions enacted as part of the remedy, were relaxed on private property adjacent to the Site, as appropriate, to encourage redevelopment. These areas had previously been considered buffer areas around the Site, however due to the stable Site conditions, the Agencies have allowed limited development in these areas. This development is consistent with current Site conditions and has not caused storm water management or unauthorized Site access problems to develop. This area of the City of Franklin is an active commercial district and future development will likely occur around the FDDS.

The original total capital cost to implement the RA described in the 1991 ROD was estimated at $1.93 million (M). The net present worth for O&M was estimated at $0.3 M for a total net present worth of $2.23 M. The Final RD Report of January 1993 provided a revised estimate of $3.76 M total capital cost and an annual O&M cost of $0.1 M during the first two years following RA completion. The difference in RA capital costs was due to additional items not originally factored into the ROD, such as pond closure costs and contingency fees. A recent assessment of actual remediation costs yielded a capital cost estimate of $4.18 M, and a total O&M cost estimate, including the first two years post-RA, of $0.843 M. The first two years were more expensive as they included quarterly, as opposed to semiannual, groundwater and leachate tank monitoring. The analytical parameters included SVOCs, which were later discontinued. These two years also included sediment and surface water sampling of the unnamed tributary. This information is provided in Table 5.

TABLE 3 - OPERATIONS AND MAINTENANCE ACTIVITIES

ACTIVITY	INSPECTION FREQUENCY	MAINTENANCE FREQUENCY
SITE FENCING	Annually	As Required
SITE ACCESS ROAD	Annually	As Required
ENVIRONMENTAL MONITORING PROGRAM		
Sample Collection and Monitoring Point Inspection	Each Sampling Event	As Required
FINAL COVER SYSTEM		
Erosion of Soil Cap	Semi-annually (a)	As Required
Grass Cover	Semi-annually (a)	As Required
Storm Water Control Structures	Semi-annually (a)	As Required
Mowing and Pruning	Twice/Year	Twice/Year (b)
LEACHATE COLLECTION SYSTEM		
Full tank Monitoring	(c)	(c)
Leachate Level Measure	(c)	(c)
Leachate Disposal		As Required
Test Cycle Pump	Quarterly	As Required
Jet Leachate Collection Line	Five-Year Interval (d)	Five-Year Interval
Tank Leak Detection	Quarterly	As Required
Cathodic Protection	Annually	As Required

(a) Inspection of the final cover system will occur semi-annually for the first two years, until vegetation has been established, and annually thereafter. (b) Mowing of vegetation will occur twice each year during the growing season; usually in early July and late September. (c) None required as direct discharge permit to Milwaukee Metropolitan Sanitary District sewer has been established. (d) Leachate collection line will be jet cleaned after two years of operation and at five-year intervals thereafter.

TABLE 4 - POST REMEDIAL ACTION MONITORING PROGRAM

MEDIUM and SAMPLING POINT	ANALYTICAL PARAMETERS	SAMPLING FREQUENCY
Groundwater: Nine Monitoring Wells onsite	Field parameters (temp., pH, conductivity) TAL, TCL (VOCs, SVOCs, pesticides/PCBs) WAC NR 508 parameters (alkalinity, COD, hardness, sodium, dissolved iron, chloride and fluoride)	Quarterly for the first 2 years after RA completion; Semi-annually for the 3rd, 4th and 5th years after RA completion; Annually for the following 25 years, unless EPA and WDNR determine a more appropriate sampling frequency and time-frame based on the five-year statistical studies and other data.
Leachate: Leachate tank	Field parameters (temp., pH, conductivity) TAL, TCL (VOCs, SVOCs, pesticides/PCBs) WAC NR 508 parameters (alkalinity, COD, hardness, sodium, dissolved iron, chloride and fluoride)	Quarterly for the first 2 years after RA completion; Quarterly for the 3rd, 4th and 5th year following RA completion; Quarterly for the following 25 years, unless EPA and WDNR determine a more appropriate sampling frequency and time-frame based on the five-year statistical studies and other data.
Surface Water (unnamed tributary): 2 locations: upstream and downstream of the FDDS.	Field parameters (temp., pH, conductivity) TAL,. TCL (VOCs and SVOCs only) WAC NR 508 parameters (alkalinity, COD, hardness, sodium, dissolved iron, chloride and fluoride)	Semi-annually for the first 2 years following RA completion; Annually for the next 28 years unless this schedule is revised by EPA and WDNR.
Sediment (Unnamed tributary): Same locations as for surface water.	TAL, TCL (VOCs and SVOCs only) Percent organic material and grain size analysis	Semi-annually for the first 2 years following RA completion; Annually for the next 28 years unless this schedule is revised by EPA and WDNR.

- Stream sediment is no longer sampled as of November 2000
- Pesticide/PCB analysis completed for the first four sampling events only
- Surface water and sediment pesticide/PCB analysis was discontinued after the first three sampling events as none were detected.

TABLE 5 - ANNUAL SYSTEM OPERATION:/O&M COSTS

Dates		Annualized Cost rounded to nearest $1,000
From	To	
1996	1998	$120,000.00
1998	2003	$100,483.00

V. Progress Since the Last Review

The last five-year review of September 14, 1998 determined that the remedies in-place at the FDDS remain protective of human health and the environment. At that time, the RACC Report had been approved and quarterly groundwater surface water and leachate monitoring had been underway since November 1995 with seven monitoring events completed. After the eighth event, future monitoring was planned to be reduced to a semi-annual schedule and the Two-Year Statistical Assessment Report was to be submitted. The recommendations of the September 1998 five year review included continued groundwater monitoring with a possible future reduction in the number of analytes based on the concentrations observed so far.

EPA had already determined that quarterly monitoring of pesticides and PCBs was no longer warranted based on the lack of detections; the expectation was that additional reductions in both the inorganic and organic parameters would be justified by the upcoming Two-Year Statistical Assessment. The seven monitoring events conducted up to that time also indicated that several inorganic parameters exceeded federal MCLs and Wisconsin PALs and ESs; hence, the cleanup goals had not yet been achieved and continued monitoring was necessary.

Since the last five-year review, the eighth round of monitoring was completed and the draft Two-Year Statistical Assessment Report was prepared and submitted to EPA and WDNR in October 1999. After reviewing and commenting on the Report, the draft was revised and subsequently approved by the Agencies in November 2000. As per the report, semi-annual monitoring was continued for the groundwater wells, private well and leachate tank, however, SVOC analysis was discontinued for the groundwater samples. Additionally, the sampling of surface water and sediment from the unnamed tributary was discontinued based on the statistical analysis of results indicating that the quality of these media is not related to past Site activities. The report concluded that iron, manganese, and fluoride were unlikely to meet groundwater cleanup goals due to the natural background content of these minerals. The Agencies discussed the need for a background groundwater study to determine the natural regional levels of these three constituents as a prerequisite to obtaining an exemption from meeting the PALs. The exemption would allow for the calculation of ACLs for these constituents in groundwater.

The draft background groundwater study was submitted by Ayres, on behalf of Menard, Inc., in January 2002. Following the Agencies' review, the background study was revised and incorporated into the Five Year Statistical Assessment Report, which was initially submitted to the Agencies in December 2002. The data encompassed by the Assessment included the Two Year Statistical Assessment data and the seven additional monitoring events conducted since then, thus comprising a comprehensive statistical evaluation of all groundwater monitoring (see Attachment 10). The Five Year Assessment Report requested that EPA and WDNR allow an exemption from meeting the PALs and ES under the 1988 NR 1 40 Ground Water Quality Standards and Chapter NR 507 Environmental Monitoring for Landfills, WAC. In conjunction with this request, Ayres proposed Wisconsin ACLs (WACLs) for the following parameters and monitoring wells (MWs): fluoride in MWs SCO and 9S; iron in MWs 6COR, 6S, and 7S; and manganese in MWs 6COR, 6S, SCO, 8D, and 9S, pursuant to subChapters NR 140.28 and NR. 507.29. The RA SOW of January 13, 1993 stipulated that WACLs could only be considered for a particular contaminant in accordance with NR 140.28, WAC, if EPA determines that it is not economically or technically feasible within the meaning of NR 140.28, WAC, to achieve one or more of the PALs.

The EPA and WDNR determined that after fifteen groundwater monitoring events, Menard, Inc. had sufficiently demonstrated that: 1) the background groundwater quality for iron, manganese and fluoride exceed the PAL/ES of NR 140; and, 2) it is neither economically nor technically feasible to attain the PAL/ES for fluoride, iron and manganese for the above-cited MWs within the meaning of NR 140.28, WAC, 1988.

The Agencies granted an exemption pursuant to subChapter NR 140.28, WAC, to exceed the PALs for fluoride (0.44 mg/1), iron (0.15 mg/1) and manganese (0.025 mg/1). These correspondences are provided as Attachment 1 to this report. The derivation of the ACLs is provided in Table 6, and the WDNR Solid Waste Technical Guidance for PAL/ACL Calculations is provided as Attachment 2. The Agencies' approval of the proposed ACLs and the determination of protectiveness is provided in the FCOR of August 6, 2003. The Five Year Statistical Assessment Report was revised accordingly and resubmitted to the Agencies in September 2003.

The Site will be undergoing a streamlined deletion from the NPL in the immediate future. The Notice of Deletion and Notice of Intent to Delete will be submitted to the Federal Register in the Fall 2003. A streamlined deletion procedure (direct final notice of deletion) is being used because the Site has not generated controversy or concern within the surrounding community over the past few years. The past community relations issues are

summarized in Section VI of this report.

TABLE 6 - DERIVATION OF ACLS for the FDDS

Monitoring Well (MW)	Parameter	Mean Concentration (mg/1)	PAL/ES (mg/l)	Calculated ACL (mg/1)	Rounded ACL (mg/l)
MW-8 CO	Fluoride	0.74	0.44/2.2	3.6	4.0
MW-9S	Fluoride	1.30	0.44/2.2	1.48	1.5
MW-6COR	Iron	0.05	0.15/0.3	0.347	0.35
MW-6S	Iron	0.10	0.15/0.3	0.303	0.30
MW-7S	Iron	0.06	0.15/0.3	0.372	0.37
MW-6COR	Manganese	0.19	0.025/0.05	0.513	0.51
MW-6S	Manganese	0.15	0.025/0.05	0.235	0.24
MW-8 CO	Manganese	0.25	0.025/0.05	0.625	0.63
MW-8D	Manganese	0.04	0.025/0.05	0.056	0.06
MW-9S	Manganese	0.04	0.025/0.05	0.051	0.05

TABLE 7 - ACTIONS TAKEN SINCE THE LAST FIVE-YEAR REVIEW

Issues from Previous Review	Recommendations/ Follow-up Actions	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
Reduce groundwater and leachate tank sampling frequency from quarterly to semiannually	Sampling frequency decreased to semi-annually as proposed. No further action required.	PRP, approved by EPA and WDNR	Oct. 1999	Groundwater monitoring network and leachate tank are sampled semiannually.	Nov. 2000
Reduction in analytes for groundwater samples	Discontinue SVOC analyses in groundwater. No further action required.	PRP, approved by EPA and WDNR	Oct. 1999	Groundwater no longer analyzed for SVOCs	Nov. 2000
Relationship between surface water/sediment quality and Site influence	Discontinue semi-annual monitoring of surface water and sediment in unnamed tributary. No further action required	PRP, approved by EPA and WDNR	Oct. 1999	Monitoring discontinued; no further sampling of surface water and sediment in unnamed tributary	Nov. 2000
Iron, manganese and fluoride do not meet groundwater cleanup goals, i.e., Wisconsin PALs	Determine whether natural background levels of these 3 parameters also exceed PALs. Grant exemption from CH. NR 140.28 WAC 1988, so that ACLs can be calculated.	PRP, approved by EPA and WDNR	Aug. 2003	Five Year Statistical Assessment and background groundwater quality assessment finished. Groundwater ACLs approved for 3 parameters.	Aug. 2003
Adjacent property owner complaint that deed restriction limits redevelopment options around the FDDS boundary	Determine whether deed restrictions enacted during RA can be revised to include only the FDDS property.	U. S. EPA	Dec. 2000	Deed restriction modified to release buffer zone areas and adjacent private property from restrictions. Redevelopment is occurring around Site as appropriate	Dec. 2000

VI. Five Year Review Process

Administrative Components

Members of the WDNR, Menard, Inc., and the City of Franklin were notified of the initiation of the second five-year review in January 2003 via a notice was placed in the local paper. The FDDS five-year review team was led by the EPA Site Remedial Project Manager Sheila Sullivan and includes EPA's Community Information Coordinator Brianna Bill. WDNR members include Project Manager Binyoti Amungwafor, District Hydrogeologist Sharon Schayer, Water Management Specialist Heidi Hopkins, Water Resources/Stormwater Specialist Jim Ritchie, and Fisheries Biologist William Wawrzyn. Representatives for Menard, Inc.

include Corporate Counsel Paul Mahler, Ayres' Project Managers Lori Rosemore and Jim Anklam, and ESC Director of Operations Frank Perugini. Beginning in January 2003, the RPM established the components of the Review, which included:

- Community Notification
- Document Review
- Data Review
- Site Inspection/Community Interviews
- Five-Year Review Report Development and Review

Community Notification and Involvement

Activities to involve the community in the five-year review process were initiated in December 2002 in the form of a notification to the Region 5 Superfund CIC for the FDDS Site. A notice announcing the initiation of the five-year review process and soliciting Site information and concerns from the community was published on January 8, 2003 m the local newspaper, the Milwaukee Journal Sentinel "Neighbors South" section (see Attachment 3).

Community interest regarding environmental issues has been historically strong due to the many proposed and existing landfills in the area. The FDDS had not generated much public interest prior to the RI/FS work. Past community relations activities for the FDDS have included public meetings held at the start and completion of the RI/FS process to present the RI results and the Proposed Plan for the Site cleanup. Informal availability sessions were also held to discuss Site issues and the cleanup status. Fact sheets were routinely distributed to update the community of the cleanup progress. EPA has also maintained two document repositories (Franklin Public Library and Franklin City Hall) in the community throughout the cleanup process.

The most recent community relations activities involved the City of Franklin Environmental Commission's concern regarding the surface water basins and runoff in the vicinity of the FDDS. The surface water basins are part of the housing development west of the unnamed tributary and are not related to the FDDS. The City wanted to request improvements to the basins to protect itself from future liability resulting from children and pets swimming in the basins and related health effects. The City was also concerned about the potential impacts to or from the Site by development of the adjacent land parcels. The Agencies provided written and verbal responses to the Commission regarding these concerns and organized a Site tour for the City commissioners on August 14, 2001 in order to better explain current Site conditions. At the request of an adjacent parcel owner, EPA modified the original deed restrictions placed on both the Site and adjacent property during the RI/FS and RD/RA activities, in December 2000. The Agencies determined that these restrictions were no longer necessary and needlessly discouraged future redevelopment opportunities.

Since the January 8, 2003 notice was published, no community members have expressed interest or concern regarding the Site itself or the five-year review process. Several community interviews were conducted on September 10, 2003 (see Attachment 4) and included: ESC staff who visit the Site on no less than a monthly basis and perform O&M activities; the manager of the Ashley Home Furnishings store now occupying the former Menard Cashway Lumber parcel; the director of the Franklin Public Library; Franklin City Clerk; Aldermanic Chair of the Franklin Environmental Commission; and, Assistant City Engineer. City of Franklin contact list is also included in Attachment 4.

Document Review

The five-year review included a review of the relevant documents which included the RI/FS, RD/RA, SOWs, ROD, all enforcement documents, and groundwater cleanup standards and risk-based levels to protect human health and the environment. Also post-RA documents such as the PCOR, first five-year review, FCOR, and applicable EPA and WDNR guidance. The comprehensive list of documents is included as Attachment 5.

Data Review

1. Groundwater

Groundwater monitoring was first conducted during the RI after the potential for groundwater contamination was realized. This task was accomplished under the May 1987 AOC. The groundwater investigation involved the installation and monitoring of five water table wells and three piezometers in nested arrangements at the four corners of the landfill. A private well (the Ballotta residence) was also included in the network. The RI results confirmed that the groundwater in the clay till had been impacted by cyanide, chromium and barium in excess of the PALs, and mercury was found in excess of its ES.

The current monitoring network includes nine nested groundwater monitoring wells and the leachate tank. According to the two and five year statistical assessments, all of the compounds monitored at the FDDS have declined in concentration over the years via the process of natural attenuation such that they either met the cleanup criteria or correspond to concentrations that are commonly measured in background groundwater samples. Environmental monitoring data consists of the following parameters and frequencies:

Monitoring Wells and Leachate Tank (Semiannually)

- Field parameters (temperature, pH, conductivity)
- Target Analyte List (TAL) parameters (inorganic constituents from the monitoring wells are field filtered; the leachate tank samples are not filtered)
- Target Compound List (TCL) (VOCs and SVOCs for 15 monitoring events; pesticides and PCB analyses were completed on the first four monitoring events only; one of the events did not include the stream locations)
- WAC NR 508 parameters (alkalinity, chemical oxygen demand, hardness, sodium, dissolved iron, chloride, and fluoride)

Inorganic Compounds
Through natural attenuation, several of the contaminants found in groundwater during the RI have declined in concentration, such as mercury, chromium and barium. The groundwater data collected over 15 monitoring events shows that iron, manganese and fluoride consistently exceed their respective PALs. These substances are also natural constituents of the groundwater of Wisconsin. An evaluation of the background groundwater quality in Milwaukee County indicated that concentrations of fluoride, iron and manganese above the established 1988 Chapter NR 140 PALs are common; hence, the levels of these substances are unlikely to be related to past Site activities and more probably reflect naturally occurring groundwater quality.

Organic Compounds
With the exception of benzene, which was found sporadically in concentrations ranging from 0.1 to 0.47 ppb, there have been no detections of VOCs in the monitoring wells exceeding their respective PALs. If the benzene contamination at the Site is the result of onsite waste disposal activities, it would be expected to show up consistently in one well or well nest or geologic material (each of the three wells is screened in a single geologic unit). Since this has not been the pattern of detections, it is unlikely that the benzene detections result from on-site waste disposal. It is more likely that the benzene detections were the result of field sample collection or laboratory errors.

Groundwater Trends
The general trend is a decline in the groundwater contaminant concentrations. Non site-related or naturally occurring contaminants are not attenuated to any degree, as would be expected. While small fluctuations are seen in the concentrations found in these wells, it is difficult to say whether they can be solely attributed to actual concentration changes or, in part, to differences in sample collection and laboratory analyses for each of the

sampling events considered. The use of standardized procedures, however, acts to minimize variations in the field and laboratory procedures. The current semi-annual sampling schedule has been appropriate for the Site.

Surface Water and Sediment

Surface water samples were collected from an unnamed tributary located west of the Site which flows in a north to south direction. The surface water has been sampled/analyzed in 9 of the 15 sampling events at both upgradient and downgradient flow locations with respect to the FDDS. Sediment samples at these locations were collected during 7 of the 15 monitoring events. The EPA and WDNR approved discontinuing surface water and sediment sampling in the unnamed tributary in November 2000. Analytical results indicate that detections over the period of monitoring for cyanide and metals are at similar concentrations in both the up and down gradient sample locations. Some minor concentration fluctuations have occurred; however, no trends were observed that are attributable to the Site. The sampling for pesticides and SVOCs was also discontinued in November 2000. While previous data suggested that the tributary water quality was impacted by former FDDS activities, the surrounding land use and data from tributary surface water and sediment samples indicate that the water quality is similar in both up and down gradient locations of the FDDS. It was concluded that urban runoff is the sole or major impact on the surface water quality of the unnamed tributary.

Surface Water (no longer sampled as of November 2000)

- Field parameters (temperature, pH. Conductivity)
- TAL (unfiltered)
- TCL (volatile organic compounds and semivolatile organic compounds only; pesticides analysis was conducted for three events)
- NR 508 parameters (alkalinity, chemical oxygen demand, hardness, sodium, dissolved iron, chloride, and fluoride)

Stream Sediment (no longer sampled as of November 2000)

- TAL
- TCL (volatile organic compounds and semivolatile organic compounds only; pesticides analysis was discontinued after three sampling events)
- Percent organic material and grain size analysis

Site Inspection

A Site inspection was conducted by members of the FDDS five-year review team on September 10, 2003. Representatives included the EPA RPM Sheila Sullivan, WDNR project manager Binyoti Amungwafor, Ayres Associates' project manager Lori Rosemore, ESC Director of Operations Frank Perugini and Scott Freimark. These representatives were also interviewed as part of the community interview process. The purpose of the inspection was to assess the protectiveness of the remedy, including the condition of the fencing and posted signs to restrict access, and the condition of the Site itself, i.e., the landfill cover, leachate collection system, monitoring wells, the surrounding land and the institutional controls. During the inspection, the representatives discussed Site and community issues. The completed inspection checklist is provided as Attachment 6.

The weather on September 10th was sunny and warm; the air temperature was about 76op. The conditions were dry as evidenced by the cracked soil in unvegetated areas. The landfill cover grasses appeared to be thick and well-maintained; however, a lack of rain left the vegetation brown and parched. The large Goodwill retail facility immediately south west of the Site has been completed. There is evidence of some lime-sediment washout from the Goodwill retaining wall which has killed a patch of vegetation in the southwest corner of the Site. This is likely due to the presence of a temporary drain to remove excess liquid off the retaining wall. This problem is expected to be resolved when the sodding and vegetation are completed along the adjacent Goodwill fence line. The representatives walked the Site perimeter, noting the condition of the fence, signs and gates. The fencing was found to be in good condition. One area on the southwest portion of the fence requires the barbed wire topping to be tightened. Both of the gates and security locks are well-

maintained. As per the RA SOW, signs are required to be posted in 200-foot intervals. Currently, the signs are posted at approximately 750- foot intervals (see attached inspection checklist). A recommendation was made to increase the number of signs. Because the signs are faded and difficult to read, the Agencies recommend that the signs be replaced with more accurate information, such as changing the Superfund Site designation to indicate that the Site is overseen by WDNR, and to provide appropriate contact information. The WDNR is looking into obtaining new signs.

The monitoring wells were also checked during the inspection and were found to be in good condition; no sign of vandalism or tampering was evident. The only problem was noted with MW 8D. The well casing and protective top were not contacting appropriately, due to settlement of the casing by 2-3 inches. A one-inch gap currently exists between the protective top and casing . This will be remedied by pulling up on the protective top. Since the casing is only 2-3 feet in the ground, it should not be affected. If this top cannot be removed, the casing will need to be cut and the pump pulled. The leachate collection system lift station, high water alarm system, drains and electrical panels were in good condition. See Attachment 7 for inspection photos.

With regard to the institutional controls at the Site, Menard Inc. had provided EPA with a copy of the declaration of deed restrictions as proof that these were in place to restrict access to and use of the Site and the surrounding property for any purposes that may potentially impair the effectiveness of the remedy (see Attachment 8). The property zoning is restricted to commercial use. The controls also prohibit the use of groundwater beneath the Site. The development of property around the FDDS has continued to occur since the 1998 five year review. In addition to the newly built Goodwill Store, the former Menard property directly north and adjacent to the Site is now occupied by the Ashley Home Furnishings store and warehouse. Further, the parcel between the Gander Mountain Store directly south of the Site and Rawson Avenue is being residentially developed. Maps of the water supply infrastructure indicate that the Franklin municipal water supply, its source being Lake Michigan, is available and utilized by the large commercial establishments and residential developments in the vicinity of the Site. However, there are some private residences south of Rawson Avenue, such as along Minnesota Avenue, that still use private wells. The City anticipates that within five years, these residences will discontinue well water use because the land south of Drexel Road will be further developed and City water mains will be extended accordingly. Figure 5 provides a map of the existing Franklin water supply infrastructure.

Although the unnamed tributary is no longer sampled, the review team visited the gauging stations where samples were collected in the past. Due to the below-average rainfall and dry conditions, the stream bed was completely dried up and traversable. The stream bed was littered with refuse such as tires, buckets and other non hazardous household debris. Natural debris from the foliage was also present. The terrestrial and riparian foliage was dense and healthy, capable of supporting numerous animal, bird and insect species.

The RPM also visited the municipal offices where maps of the City property and aerial printouts were reviewed and obtained. An interview was also held with the City Clerk's office, Engineering department and Environmental Commission. Finally, a visit was made to the local Administrative Record repository at the Franklin Public Library, 9151W. Loomis Rd. and Franklin City Hall, 9229 W. Loomis Rd. to review the documents.

Interviews

As mentioned, interviews were conducted with various representatives from the City of Franklin engineering and administrative offices, Franklin Environmental Commission, Ashley Home Furnishing Store and the Franklin Public Library director. These interviews are summarized in Attachment 4.

VII. Technical Assessment

Question A: *Is the remedy functioning as intended by the decision documents?*

Remedial Action Performance

Based on a review of relevant documents, applicable or relevant and appropriate requirements (ARARs), risk assumptions, and the results of the site inspection, the remedy currently appears to be functioning as intended by the ROD and attendant documents, and is expected to continue in this manner. The effectiveness and progress of the remedy has been tracked through the monitoring program. Site monitoring in accordance with the requirements listed in Table 4, has been performed since November 1995 and encompasses data from 15 monitoring events. These data indicate that the FDDS neither poses a threat to human health or the environment, nor is it expected to in the future.

The RA for this Site consisted of hazardous waste excavation, demolition waste consolidation and landfilling onsite, construction of a landfill cap and leachate collection system, groundwater monitoring as long as necessary, and institutional controls. All RA and construction activities have been completed and the Site poses no apparent public health hazard. The contaminated areas of this Site included the soil and surface water in the former disposal area, surface water and sediments in the unnamed tributary, and the groundwater. The former disposal area surface water pond has been de-watered and the soils and consolidated waste have been covered with a four-foot soil cap (two feet of rooting soil and two feet of clay) in compliance with Chapter NR 504.07, WAC landfill closure requirements. The only residual contamination from this area is collected and piped to the underground leachate tank. The tank contents are sampled semi-annually and discharged to the MMSD. The Site perimeter is secured by a continuous 6-ft high chain link fence topped with three strands of barbed wire. Though warning signs are posted on the fence, the intervals between signs are greater than the specified 200- ft intervals. The Site can be accessed via two gate locations which are locked and chained. The EPA and WDNR representatives recommended that additional signs be posted. The Agencies also recommended that the signs be ultimately updated so as not to reference the property as a Superfund Site, as deletion of the Site from the NPL is imminent,

As mentioned, tributary surface water and sediments were respectively sampled during nine and seven monitoring events at locations upgradient and downgradient of the FDDS. EPA and WDNR approved discontinuing sampling of the tributary in November 2000 after the results showed similar concentrations of cyanide and metals both up and downgradient of the Site. The surrounding land use and these data indicated that urban runoff is the chief impact on sediment and water quality in the tributary.

The effectiveness and progress of the groundwater cleanup via natural attenuation has been closely tracked. Based on evaluation of groundwater data collected since the source control action was implemented, EPA concluded that the FDDS meets the overall cleanup objectives of the ROD, including all site-related contaminant-specific cleanup goals. According to the two and five year statistical assessments of these data, all of the compounds monitored for at the FDDS have either met the cleanup criteria, i.e., the PALs set forth in the 1988 WAC Chapter NR 140 Ground Water Quality Standards, or correspond to concentrations that are measured in background samples, thus reflecting the naturally occurring levels of these constituents. Only iron, manganese, and fluoride concentrations are detected in certain wells at levels above the PAL. As discussed in this report, iron, manganese, and fluoride can be attributed to naturally occurring compounds in the geologic material and will therefore be present in the regional background groundwater as well. As such, these constituents are never likely to comply with the PALs either onsite or in offsite local wells.

System Operations/O&M

The FDDS Operation and Maintenance (O&M) Plan was prepared in conjunction with the RD SOW (September 25, 1991) and RA SOW (April 14, 1993). The Plan, issued September 25, 1995, was revised and reissued in November 1995, and addresses long- term maintenance of Site fencing, Site roads, the leachate collection system, and the final cover system. Post-closure care for the cover is performed in compliance with WAC, Chapters NR 507, 508 and 514. The Plan also specifies a long- term Environmental Monitoring Program for the Site. This program and other O& M activities are detailed in Table 3. The Site owner, Menard, Inc., performs these responsibilities through Ayres Associates, pursuant to the April 1993 UAO and the incorporated RD and RA SOWs.

The WDNR has concurred, in concept, with the upcoming deletion of the FDDS from the NPL; hence, EPA in conjunction with WDNR has determined that the Site has been cleaned up in accordance with the requirements set forth in the 1991 ROD and the specifications of the RA SOW. As WDNR is not a co-signer of the 1993 UAO, it is preparing to enter into an AOC with Menard, Inc. for the continuation of environmental monitoring and O&M at the Site. The WDNR will manage the FDDS as a closed landfill under its Solid Waste Program WAC Chapter NR 514.05.9. Semi-annual monitoring of groundwater and leachate will continue under this arrangement until such time as Menard, Inc. petitions WDNR for a reduction in sampling frequency. This guidance is included as Attachment 9. The WDNR will send a formal letter of concurrence to EPA for the Site deletion as soon as its AOC with Menard is in place.

Opportunities for Optimization

Currently, there are no opportunities for optimization.

Early Indicators of Potential Issues

Currently there are no early indicators of potential issues.

Implementation of Institutional Controls and Other Measures

Institutional controls at the FDDS were implemented via deed restrictions filed at the Milwaukee County Register's Office on June 14, 1993 (see Attachment 8). The declaration prohibits the use or development of land within the Waste Management Boundary in a manner that is inconsistent with or may impair the integrity of the remedial measures undertaken at the Site. Further, the restrictions prohibit all future residential use of the property and the use of groundwater underlying the FDDS. The declaration also provides that all of the restrictions contained within are covenants and will run with the land; all future owners must accept the terms of the declaration.

As mentioned, Site access controls are in place and consist of a Site perimeter fence and posted warning signs. Observations made on September 10, 2003 indicate that the perimeter fence and signs are being adequately maintained. As per the September 10, 2003 inspection, the Agencies recommended that signs be replaced with more visible and accurate information. The barbed wire strands on one southwest portion of the fence be tightened. Monitoring Well 8D requires repair due to casing settlement. The landfill cap and leachate collection system are well-maintained. There is no evidence of vandalism or trespassing activity at the Site. The interviews conducted on September 10, 2003 with the City of Franklin administrative staff indicated that no issues or problems have arisen with respect to enforcing the deed restrictions for the property. Discussions with ESC staff and staff of nearby commercial properties indicated that no trespassing has been witnessed.

Question B: ***Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of remedy selection still valid?***

There have been no changes in the physical conditions of the Site that would affect the protectiveness of the remedy. There have been changes in the cleanup standards identified in the ROD. These changes have occurred since the first Five Year Review of September 14, 1998 and are discussed below.

Changes in Standards and TBCs

Chemical-Specific ARARs

The chemical-specific ARARs for the each of the affected Site media are described below. No new classes of potential chemical-specific ARARs were noted since the ROD. The controlling ARAR categories remain the PALs set forth in the Wisconsin 1988 NR 140 Ground Water Quality Standards code and Chapter 160, Federal Maximum Contaminant Levels (MCLs) under the Safe Drinking Water Act (SOWA) and Ambient Water Quality Criteria (AWQC) under the Clean Water Act (CWA). However, since the ROD and 1998 five-year review, the cleanup goals for certain chemicals have been revised.

Groundwater

The ROD identified the 1988 NR 140 Wisconsin groundwater standards as the cleanup goals for the Site. This statute specifies the use of chemical-specific PALs and ESs for groundwater cited in Ch NR 140.10. Also relevant and appropriate are the federal MCLs, however MCLs are less stringent than state PALs. Three constituents, iron, manganese and fluoride continue to exceed the PALs in the Site groundwater. An evaluation of the background groundwater, intended to reflect the naturally occurring levels of these constituents, indicated that concentrations of fluoride, iron and manganese above the established 1988 Chapter NR 140 PALs are common and more probably reflect naturally occurring groundwater quality. If the naturally occurring levels of these constituents, also measured onsite, exceed the cleanup requirements, then these constituents cannot be feasibly addressed via the RA. To address the higher levels of these compounds onsite, an exemption was granted by the WDNR in a letter of July 29, 2003, allowing the calculation of WACLs for these constituents under CH NR 140.28. The approval of WACLs, respectively calculated for iron in three monitoring wells, manganese in five wells, and fluoride in two wells (see Tables 6 and 8) brings the FDDS into full compliance with the WAC 1988 Chapter NR 140 Groundwater Quality Standards and the RA goals.

Wisconsin PALs and ESs continue to define acceptable groundwater concentrations at the Site, however, an exceedance does not necessarily trigger remedial action as long as protectiveness is maintained. These WACLs do not affect the protectiveness of the remedy because institutional controls prohibiting the use of groundwater at the Site for any and all current and future purposes is also in effect. These prohibitions were enacted on June 14, 1993.

It should be noted that some revisions to the chemical-specific PALs have occurred since the 1988 groundwater quality standards were issued by WDNR and identified as groundwater ARARs in the 1991 ROD. The more recent 200 1 PAL update was assessed to determine whether these were more or less stringent than the 1988 PALs with respect to the groundwater contaminants at the FDDS. Compared to the 1988 PALs, the 2001 PALS are less stringent for barium, benzene, chromium, fluoride and selenium; and more stringent for cadmium, copper, and lead. The previously unregulated metals -- Nickel, thallium and vanadium -- were assigned PALs in 2001 (see table 9). These changes have not affected the remedy since these metals whose PALs have become more stringent were infrequently detected in the groundwater at low levels. The chemicals detected at the Site through the time of the 1991 ROD remain subject to the ARARs identified at that time. The calculation of WACLs under the 1988 NR 140.28 is also part of that groundwater ARAR. The WDNR has determined that if any future new contaminants are discovered at the Site which were not originally found during the RI/FS, RD/RA or O&M activities as of the FCOR, these contaminants will not be subject to the 1988 PALs, but instead will be subject to the most recent Wisconsin Groundwater Quality Standards under NR 140, WAC.

TABLE 8 - CHANGES IN CHEMICAL-SPECIFIC CLEANUP GOALS

Monitoring Wells	Media	Cleanup Level (mg/L)	Standard (mg/L)		Citation /Year
FLUORIDE					
MW-8CO	groundwater	0.44/2.2	Previous	0.44	NR 140.10 WAC, for PALs/1988
			New	4.0	NR 140.10 WAC, for PALs/1988
MW-9S	groundwater	0.44/2.2	New	1.5	ACLs approved/2003
IRON					
MW-6COR	groundwater	0.15/0.30	Previous	0.15	NR 140.10 WAC, for PALs/1988
			New	0.35	NR 140.28 WAC, for ACLs/1988
MW-6S	groundwater	0.15/0.30	New	0.30	ACLs approved /2003
MW-7S	groundwater	0.15/0.30	New	0.37	
MANGANESE					
MW-6COR	groundwater	0.025/0.05	Previous	0.025	NR 140.10 WAC for PALs/1988
			New	0.51	NR 140.28 WAC for ACLs /1988
MW-6S	groundwater	0.025/0.05	New	0.24	ACLs approved /2003
MW-8CO	groundwater	0.025/0.05	New	0.63	
MW-8D	groundwater	0.025/0.05	New	0.06	
MW-9S	groundwater	0.025/0.05	New	0.05	

Surface Water

The ROD did not cite any ARARs with regard to surface water and sediment of the unnamed tributary, however surface water concentrations were assessed during the RI with regard to the Federal AWQC for the protection of aquatic life, for which only cyanide was exceeded. The data indicated that the Site contributed cyanide to the surface water which potentially could adversely impact aquatic species, but such impacts were expected to be minimal, particularly after remediation occurred. The artificial surface pond onsite was not considered since it does not qualify as "waters of the State". An ARAR exceedance does not necessarily trigger remedial action, as long as protectiveness is maintained. Since the 1998 five year review, no new ARARs were cited for surface water and sediment.

Soils

The ROD did not cite any ARARs with regard to soils at the Site; however remedial alternatives were assessed based on residual risks.

TABLE 9 - CHANGES IN CHEMICAL-SPECIFIC STANDARDS

Contaminant	Media	Cleanup Level	Standard (PAL/ES) (mg/L)		Citation/Year
Nickel	Groundwater	None Established	Previous	—--	NR 140.28 WAC/1988
			New	0.02/0.1	NR 140.28 WAC/2001
Thallium	Groundwater	None Established	Previous	—--	NR 140.28 WAC/1988
			New	0.0004/0.002	NR 140.28 WAC/2001
Vanadium	Groundwater	None Established	Previous	—--	NR 140.28 WAC/1988
			New	0.006/0.03	NR 140.28 WAC/2001
Cadmium	Groundwater	0.001 mg/L	Previous	0.001/0.01	NR 140.28 WAC/1988
			New	0.0005/0.005	NR 140.28 WAC/2001
Copper	Groundwater	0.5 mg/L	Previous	0.5/1.0	NR 140.28 WAC/1988
			New	0.13/1.3	NR 140.28 WAC/2001
Lead	Groundwater	0.005 mg/L	Previous	0.005/0.05	NR 140.28 WAC/1988
			New	0.0015/0.015	NR 140.28 WAC/2001
Barium	Groundwater	0.2 mg/L	Previous	0.2/1.0	NR 140.28 WAC/1988
			New	0.4/2.0	NR 140.28 WAC/2001
Chromium	Groundwater	0.005 mg/L	Previous	0.005/0.05	NR 140.28 WAC/1988
			New	0.01/0.1	NR 140.28 WAC/2001
Selenium	Groundwater	0.001 mg/L	Previous	0.001/0.01	NR 140.28 WAC/1988
			New	0.01/0.05	NR 140.28 WAC/2001

Location-Specific ARARs

Applicable location-specific ARARs included 40 CFR Part 6 App. A, which contains U. S. EPA policy for carrying out provisions of Executive Orders 11988 (Floodplain Management) and 11990 (Protection of Wetlands). This requires action to avoid or minimize adverse impacts on wetlands and to preserve and enhance natural values of wetlands and floodplains. The waste fill area, however, is not within the regulatory limits of the delineated floodplain, and there have been no issues concerning this ARAR. The 1991 ROD also specified institutional controls which would be considered a location-specific ARAR. The institutional controls were implemented as a deed restriction placed on the Site and adjacent property during the RI/FS and RD/RA activities in June 1993. The restriction prevents all uses of the groundwater beneath the FDDS, prohibits use of the property or activities at the property that would interfere with the implementation or effectiveness of the RA or any component thereof, and prohibits residential use of the property.

The EPA modified the original deed restrictions in December 2000, at the request of the owner of an adjacent parcel. The Agencies determined that these restrictions on his property were no longer necessary and too restrictive of future redevelopment opportunities. The modification has not impacted the effectiveness or protectiveness of the remedy and the restrictions on the FDDS property itself are still in place (Table 10).

TABLE 10 - CHANGES IN LOCATION-SPECIFIC REQUIREMENTS

Location	Requirement		Prerequisite	Citation/Year
FDDS Property	Previous	Deed restriction against entire property to ensure all areas of potential remediation would be covered	1991 ROD	June 14, 1993
	New	Rescinded Deed Restriction for small portion of property purchased by another party from the RP, Menard, Inc.; post-RA activity confirmed this area was not subject to the RA and no longer warranted restriction.	June 1993 Declaration of Restrictions allows petitioning for revisions	July 24, 2001

Action-Specific ARARs and TBCs

These ARARs and TBCs reported in the ROD relate to waste handling and management during the RA and the design, construction and operation of solid waste landfills. The major ARARs are the following:

- Land Disposal Restrictions, 40 CFR Part 268.
- Solid Waste Closure Requirements, CH NR 504, 5 06, 514, 516, WAC.
- Hazardous waste disposal, recycling, transport and manifesting, CH NR 600 et. Seq., WAC.
- CERCLA Off-site Policy, OSWER Dir. 9834.11.
- Wisconsin "Interim Policy for Promoting the In-state and On-site Management of Hazardous Wastes in the State of Wisconsin".

The only ARAR still applicable involves the closure requirements for solid waste landfills, specifically the long-term groundwater and leachate monitoring requirements. There have been no changes in these requirements which impact the protectiveness of this remedy.

Changes in Exposure Pathways

During the conduct of the RI/FS, the exposure pathways of greatest concern at the FDDS included: 1) the exposure of trespassers to contaminated fill and sediment while playing onsite; and, 2) the exposure of children to surface water while swimming in the onsite pond. The hypothetical future Site exposure pathways of greatest concern included: 1) the exposure of onsite residents (children/young adults) to exposed contaminated fill in gardens onsite; and, 2) the exposure to daily groundwater consumption by children and young adults. The other exposure concern was due to the release of containerized wastes during future construction activities onsite. The latter risk could not be well-quantified at the time but was estimated to exceed acceptable risk limits established by EPA.

Since the RA completion and deed restriction filing, the onsite exposure pathways are^ no longer relevant since the exposures of concern have been interrupted. There have been no new exposure pathways that would impact the protectiveness of the remedy.

Changes in Toxicity and Other Contaminant Characteristics

There have been changes in toxicity values since the RA was completed at the FDDS. These have namely included the chemicals: tetrachloroethylene, tnchloroethylene, bis(2-ethylhexyl) phthalate, carcinogenic and noncarcinogenic PAHs, lead and barium. However, these changes do not impact the protectiveness of this remedy.

Changes in Risk Assessment Methods

There have been no changes in risk assessment methods that would impact the protectiveness of this remedy.

Expected Progress Toward Meeting RAOs

The remedy has progressed as expected and has met all remedial action objectives.

Question C; Has any other information come to light that could call into question the protectiveness of the remedy?

There is no new information that has come to light that could affect the protectiveness of the remedy. The issues that were raised earlier in the report do not impact the Site or the remedy.

Technical Assessment Summary

Based on a review of relevant documents, ARARs, risk assumptions, and the results of the site inspection, the remedy currently is functioning as intended by the ROD, and is expected to continue in this manner. The effectiveness of the remedy has been tracked through the monitoring program, which has been performed since November 1995 and included 15 monitoring events. These data indicate that the FDDS neither poses a threat to human health or the environment, nor is it expected to in the future. The FDDS O&M Plan addresses long-term maintenance of Site fencing, Site roads, the leachate collection system, and the final cover system. Post-closure care for the cover is performed in compliance with WAC, Chapters NR 500-520. The Plan also specific long-term environmental monitoring for the Site. Menard, Inc., performs these responsibilities pursuant to the 1993 UAO. The U. S. EPA and WDNR, in concurring on the upcoming deletion of the FDDS from the NPL, have determined that the Site has been cleaned up according to the 1991 ROD. The WDNR is preparing to enter into an AOC with Menard, Inc. for the continuation of environmental monitoring at the Site, and will manage the Site as a closed landfill under its Solid Waste Program WAC Chapter NR 514.05.9. Semi-annual monitoring of groundwater and leachate will continue under this arrangement until such time as Menard petitions for a reduction in sampling frequency.

The ROD identified the 1988 NR 140 Wisconsin groundwater standards as the cleanup goals for the Site, specifying the use of PALs and ES. As previously discussed, iron, manganese and fluoride continue to exceed the PALs in the groundwater. A background groundwater evaluation showed that concentrations of fluoride, iron and manganese above the 1988 NR 140 PALs more likely reflects the natural groundwater quality. Because these three onsite constituents cannot be feasibly addressed via the RA, an exemption enabled the calculation of ACLs for these constituents in specific wells. The approval of these ACLs brings the FDDS into full compliance with the 1988 Wisconsin Groundwater Quality Standards and the RA goals. The WACLs do not affect the protectiveness of the remedy because institutional controls prohibiting the use of groundwater at the Site for any and all current and future purposes is also in effect.

The protectiveness of these new cleanup goals can be addressed by putting them into perspective with other health criteria for the three constituents. When the WACLs are compared to the EPA **primary** MCLs established to protect human health from drinking water ingestion, they are of the same magnitude of concentration. **1** The PAL for a contaminant is typically one-half of its respective primary MCL and is therefore even more protective of human health. When the WACLs are compared to their respective EPA **secondary** MCLs (SMCLs), they are either the same or one order of magnitude higher than the SMCL (as in the case of manganese); however, SMCLs are non-enforceable guidelines developed for certain parameters to maintain the aesthetic qualities of drinking water; they are not related to health protection. Wisconsin has chosen to adopt SMCLs as State Enforcement Standards. Due to the physical/chemical nature of these parameters, SMCLs are typically more stringent values than the primary MCLs or any other health-based limit owing to the low concentrations at which they exhibit nuisance characteristics.

The WACLs calculated for fluoride range from 1.5 to 3.6 mg/L. These values exceed the PAL (0.44 mg/L) and ES (2.2 mg/L) but are below the MCL for fluoride of 4.0 mg/L. In addition, EPA has assigned a secondary MCL (SMCL) of 2.0 mg/L to fluoride.

Because iron is an essential nutrient, EPA has not promulgated a primary MCL. The WACLs calculated for iron range from 0.30 to 0.37 mg/L. While all three WACLs exceed the PAL (0.15 mg/L) and two of the WACLs slightly exceed the SMCL and ES for iron of 0.3 mg/L, no adverse health impacts would be expected at these levels. This SMCL value was set to prevent rusty discoloration, reddish-orange staining of fixtures and metallic taste.

Similarly, in the case of the essential nutrient manganese, there is no promulgated primary MCL. An SMCL of 0.05 mg/L was set to prevent black-brown discoloration of water, black staining and bitter metallic taste. The WACLs calculated for manganese range from 0.051 to 0.625 mg/L. These values exceed both the PAL (0.025 mg/L) and ES (0.05 mg/L), however the manganese WACLs would not be expected to produce adverse health effects. From the availably manganese toxicity information, EPA concluded that an appropriate oral reference dose (RfDo) for manganese is 0.14 mg/kg-day based on dietary manganese intake. This amounts to an adult dose of 10 mg/day and a child dose of 2.1 mg/day. These values represent an estimate of a daily oral exposure that are unlikely to pose appreciable risk of deleterious effects over a lifetime of exposure, taking into account any uncertainties.

When assessing exposure to manganese from drinking water alone, EPA recommends that the RfDo be modified by a factor of 3, thus producing an RfDo of about 50 ug/kg-day, which is equivalent to an acceptable adult drinking water concentration of 1.75 mg/1 and an acceptable drinking water concentration of 0.60 mg/1 for children. Of the manganese potentially ingested via drinking water, less than ten percent is bioavailable for absorption by the receptor; therefore, it is unlikely that groundwater use in the vicinity of the Site would produce adverse health effects. As mentioned, the approval of these WACLs brings the FDDS into full compliance with the 1988 Wisconsin Groundwater Quality Standards and the RA goals.

Pursuant to the ROD, deed restrictions were placed on the Site in June 1993. This prevents use of the groundwater beneath the FDDS, prohibits use of the property that would interfere with the effectiveness of the RA, and prohibits residential use of the property.

The EPA modified the boundary of the deed restriction m 2000, at the request of the owner of an adjacent parcel, as they were too restrictive of future redevelopment opportunities. The modification has not impacted the effectiveness or protectiveness of the remedy and the restrictions on the FDDS property itself are still in place. No new information that has come to light that could affect the protectiveness of the remedy. While some revisions to the chemical-specific PALs have occurred since the Wisconsin 1988 groundwater quality standards were identified as the groundwater ARARs, these changes do not affect the remedy since these were infrequently detected in the groundwater at low levels.

1 This comparison is valid only for fluoride, as it is the only one of the three constituents for which a primary MCL has been promulgated by U. S. EPA.

Environmental Indicators

An analysis of the environmental indicators with regard to controlled human exposures and controlled groundwater migration was performed. It was concluded that all identified human exposure pathways from contamination at the Site are under control or are below health-based levels for both current and future land and groundwater use conditions. Since there are no complete pathways between the contamination and human receptors, exposures cannot be reasonable expected to occur.

Although the groundwater contamination is documented as exceeding regulatory levels, it is not contaminated above risk-based levels Further, the level and movement of groundwater contaminants is stabilized such that it is reflective of background conditions The groundwater does not discharge into surface water bodies and is not accessible to human receptors

VIII. Issues

TABLE 11- ISSUES

Issues	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
Perimeter fence barbed wire topping needs repair in the southwestern portion of the fence	N	N
Signs posted along perimeter fence are faded and difficult to read The required posting interval (200 ft) between signs is exceeded (currently at ~750 ft)	Y	Y
MW 8D protective cap and casing do not contact properly due to casing settlement	N	N

IX. Recommendations and Follow-up Actions

Table 12 below provides a list of the issues and follow-up actions that will be taken to correct the identified problems

TABLE 12 - RECOMMENDATIONS AND FOLLOW UP ACTIONS

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
Fence barbed wire repair needed in southwestern portion.	Barbed wire strands need to be tightened or replaced. If left unaddressed, future protectiveness may be impacted.	PRP(Menard, Inc.)	EPA and WDNR	9/30/2003	N	N
Signs posted along perimeter fence are faded; the required posting interval (200 ft) between signs is exceeded.	Replace signs with more current information; make signs larger to be more visible; post signs at required intervals. Larger signs can be posted at longer intervals (e.g., 400 ft.)	PRP(Menard, Inc.)	EPA and WDNR	9/30/2003	Y	Y
MW 8D protective cap and casing do not flush properly due to settling.	Protective cap must be pulled up. Casing must be adjusted and recemented.	PRP(Menard, Inc.)	EPA and WDNR	9/30/2003	N	N

X. Protectiveness Statement

Because the site-wide remedial action is protective, the Site is protective of human health and the environment. All data and observations collected and evaluated during this review indicate that the remedy is functioning as intended by the ROD and is expected to continue in this manner. The FDDS neither poses a threat to human health or the environment, nor is it expected to in the future. The effectiveness of the remedy has been tracked through the monitoring program, which has been ongoing for the past eight years and will continue into the future as necessary.

The Site O&M Plan addresses long- term maintenance of Site fencing, Site roads, the leachate collection system and the landfill cap, and specifies long-term environmental monitoring for the Site. Menard, Inc., performs these responsibilities pursuant to the 1993 UAO. The EPA and WDNR have determined that the Site has been cleaned up according to the ROD, and EPA has begun NPL site deletion activities. The WDNR plans to enter into an AOC with Menard, Inc. for the continuation of environmental monitoring and O&M activity at the Site, and will manage the Site as a closed landfill under its Solid Waste Program. Semi- annual monitoring of groundwater and leachate will continue under this arrangement until such time as Menard, Inc. petitions for a reduction in sampling frequency. Further, deed restrictions placed on the Site in June 1993 prevent the use of groundwater beneath the Site, prohibit use of the property that would interfere with the effectiveness of the RA, and prohibit residential use of the property in perpetuity.

XI. Next Review

The next five year review for the Fadrowski Drum Disposal Site is required by September 2008, five years from the date of this review.

Figures

Figure 1 - Site location map
Figure 2 - Site location overview map
Figure 3 - Site aerial feature map
Figure 4 - Property parcel map Site groundwater monitoring wells
Figure 5 - City of Franklin water infrastructure map

Attachments

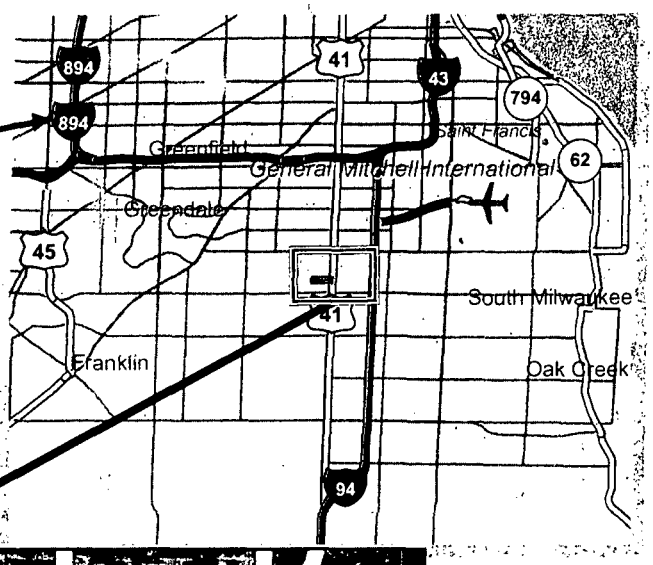
Attachment 1 - Letters regarding WDNR and EPA approval of WACLs
Attachment 2 - WDNR Solid Waste Technical Guidance for calculating PAL/ ACLs
Attachment 3 - Public Notice announcing start of second five- year review
Attachment 4 - Community interview summary and City of Franklin contact list
Attachment 5 - List of Documents reviewed for five-year review
Attachment 6 - Five- year review inspection checklist
Attachment 7 - Photograph log of September 10, 2003 inspection
Attachment 8 - Declaration of Restrictions for the FDDS
Attachment 9 - WDNR Solid Waste Technical Guidance for Reducing or Terminating Groundwater Monitoring
Attachment 10 - Cumulative groundwater data for metals at the FDDS

FIGURES

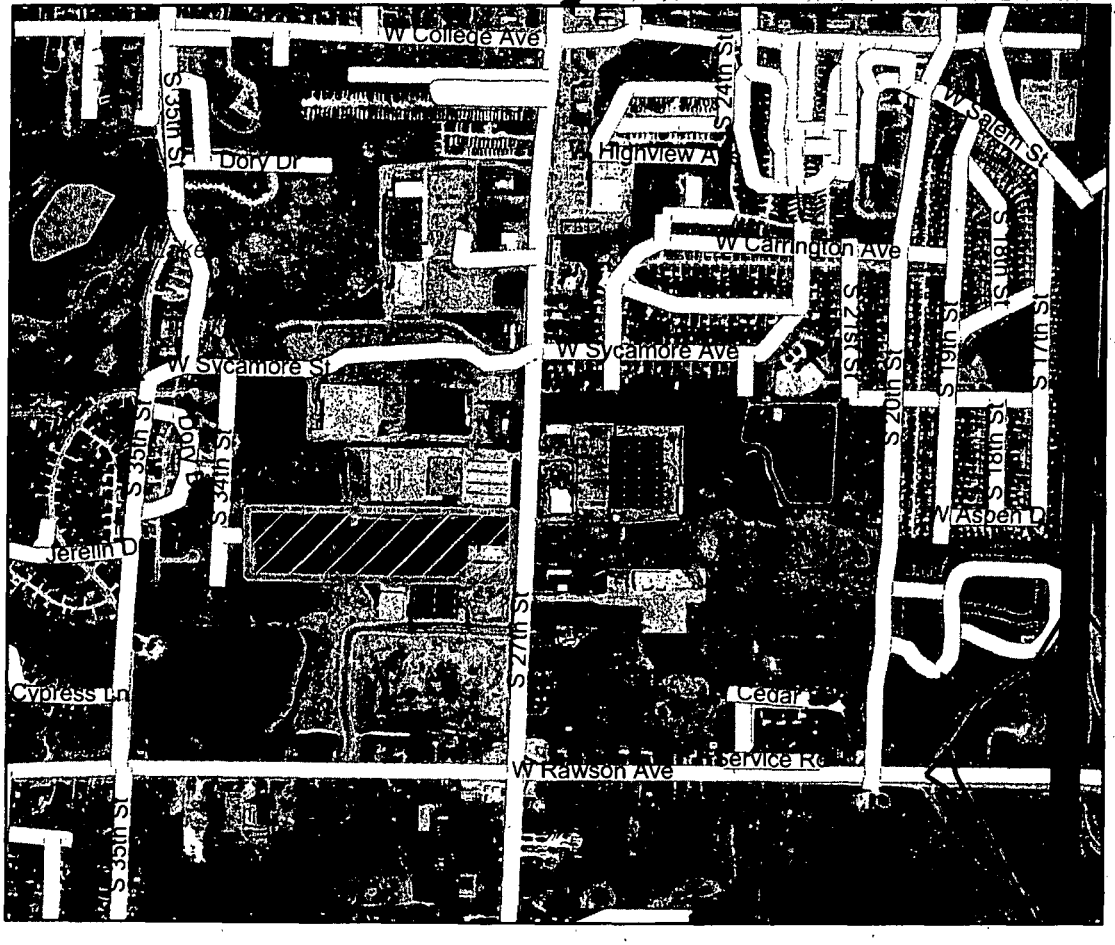
Fadrowski Drum Disposal Superfund Site

1) State

2) Milwaukee County



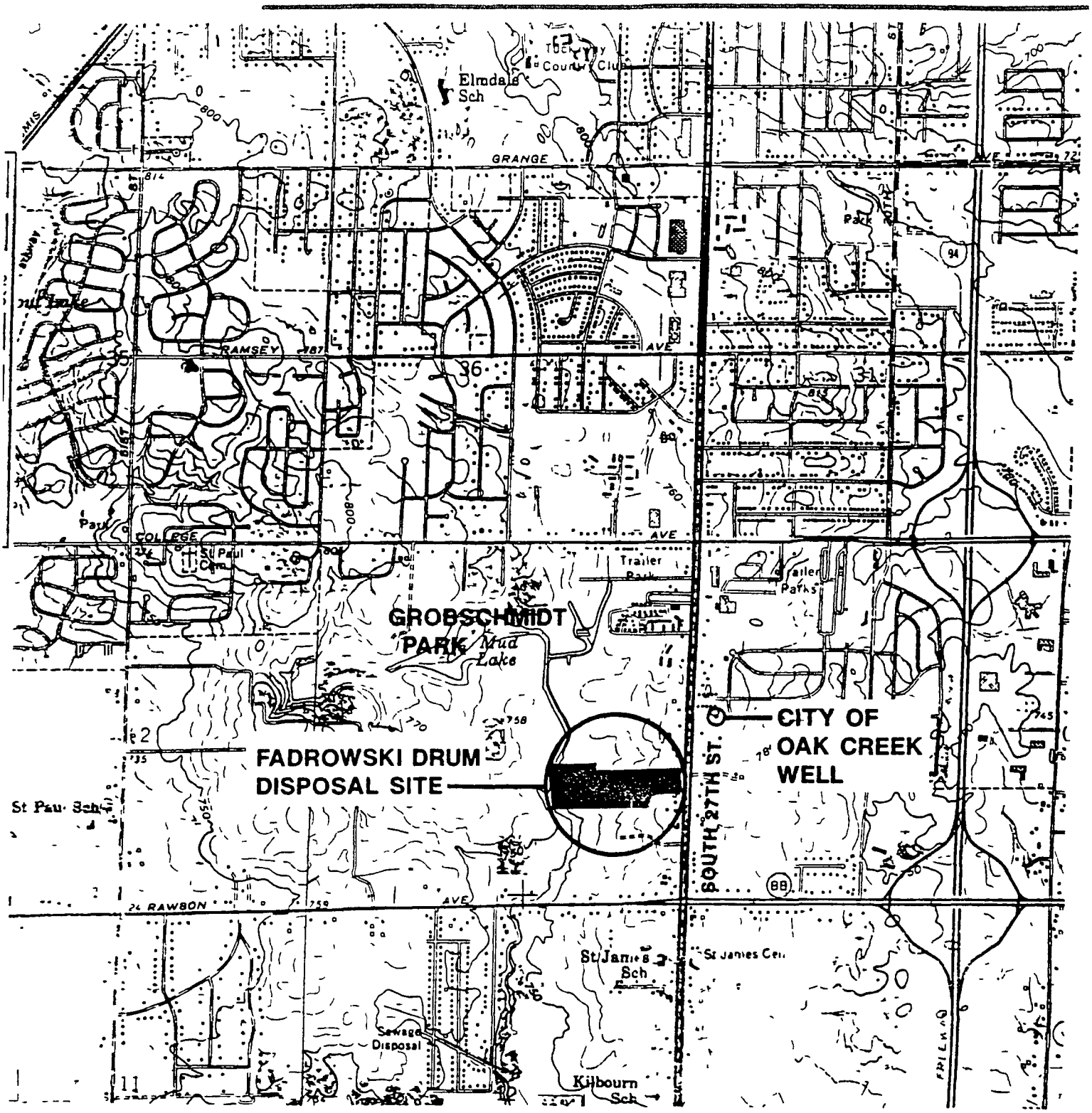
3) Fadrowski Drum Disposal Site



Plot created by Juliana R. Prospert U.S. EPA Region 5/30/2003
B & W Image

Figure 1

FIGURE 2



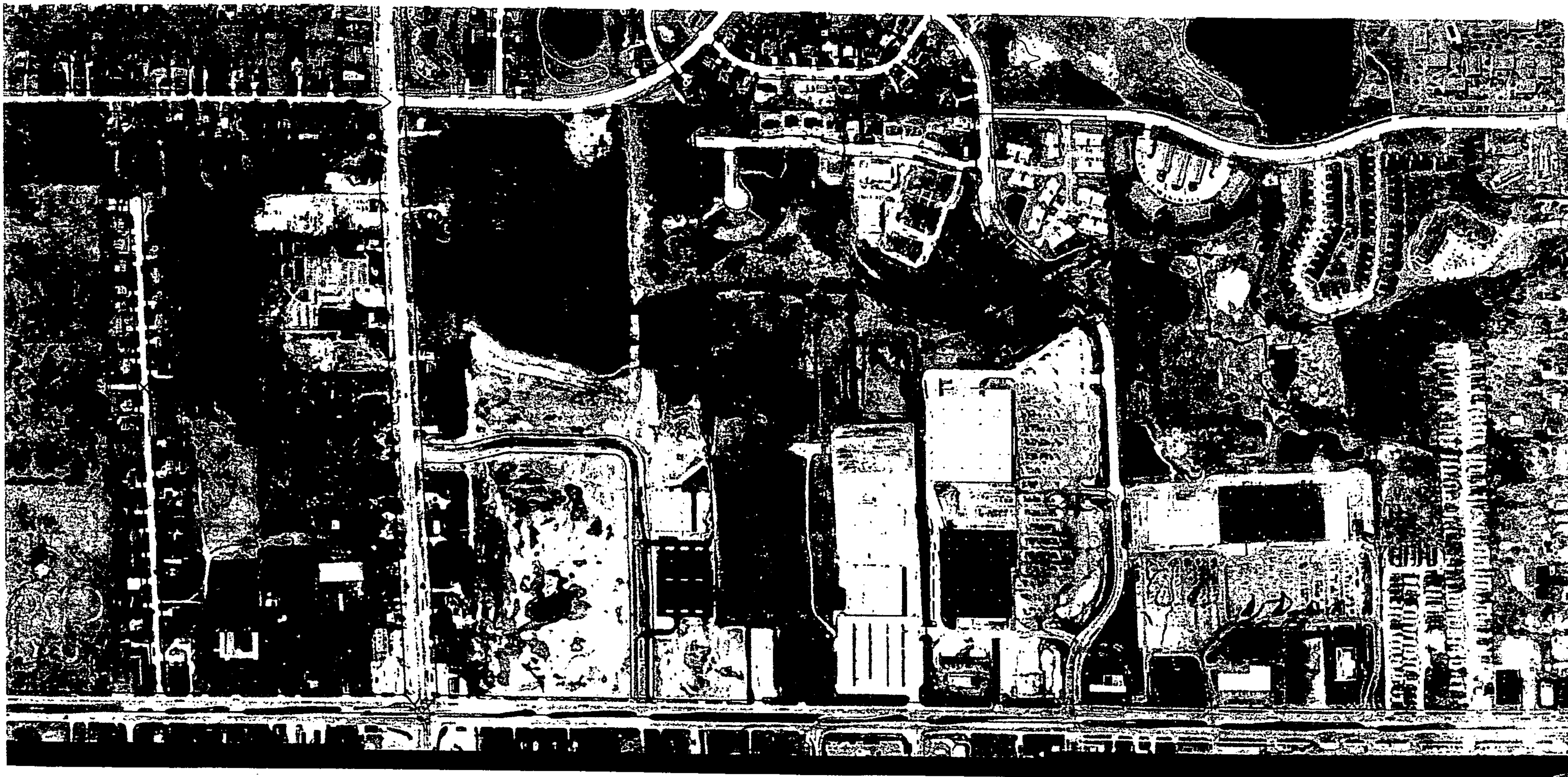
NOTES

1. BASE MAP DEVELOPED FROM THE GREENDALE, WISCONSIN 7½ MINUTE U.S.G.S. TOPOGRAPHIC QUADRANGLE MAP, DATED 1958, PHOTOREVISED 1971 AND 1976

north

0 2000 4000

SCALE IN FEET



FDDS Site
outlined in Blue

N →

1" = 500'

FIGURE 3

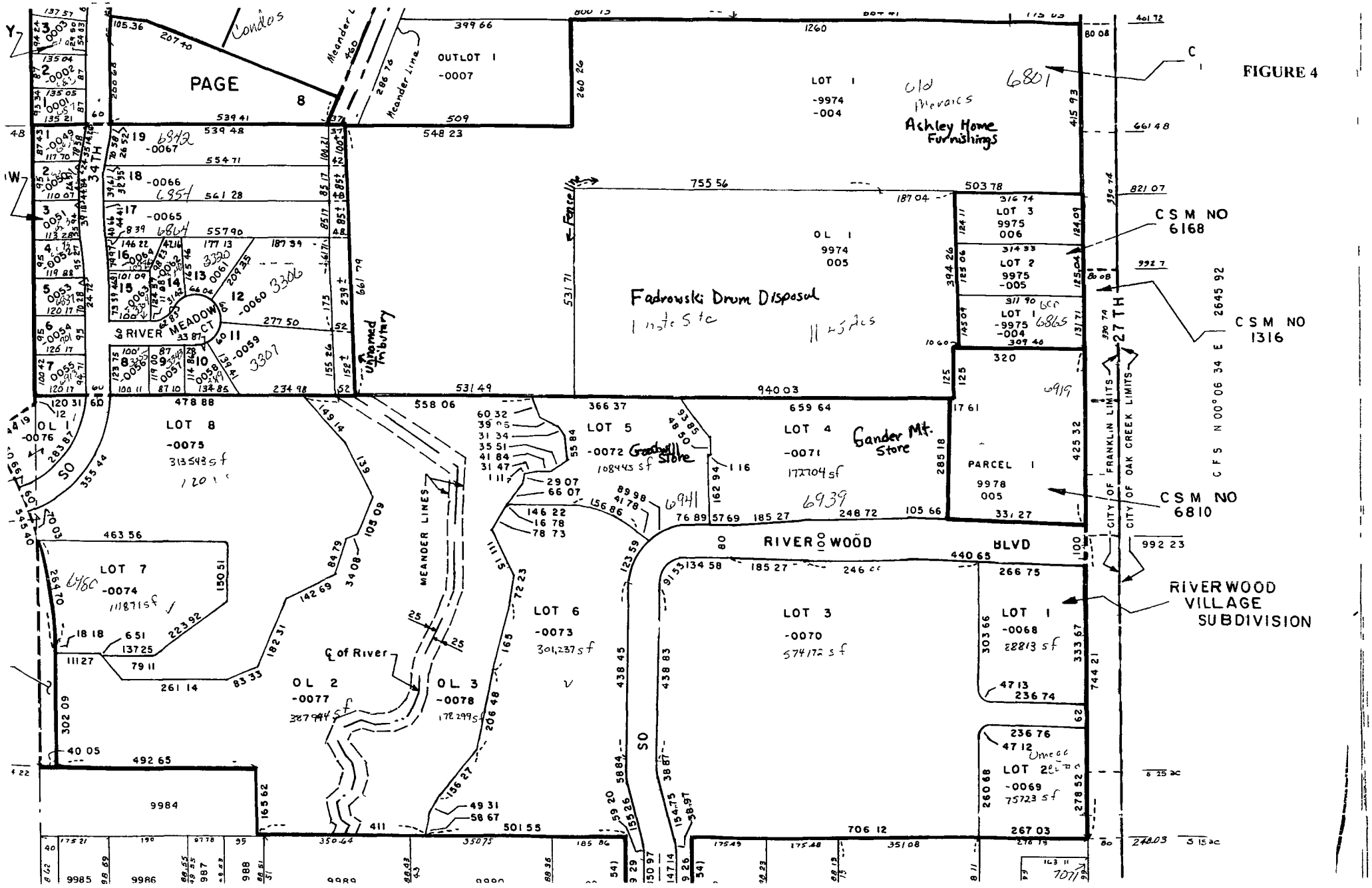
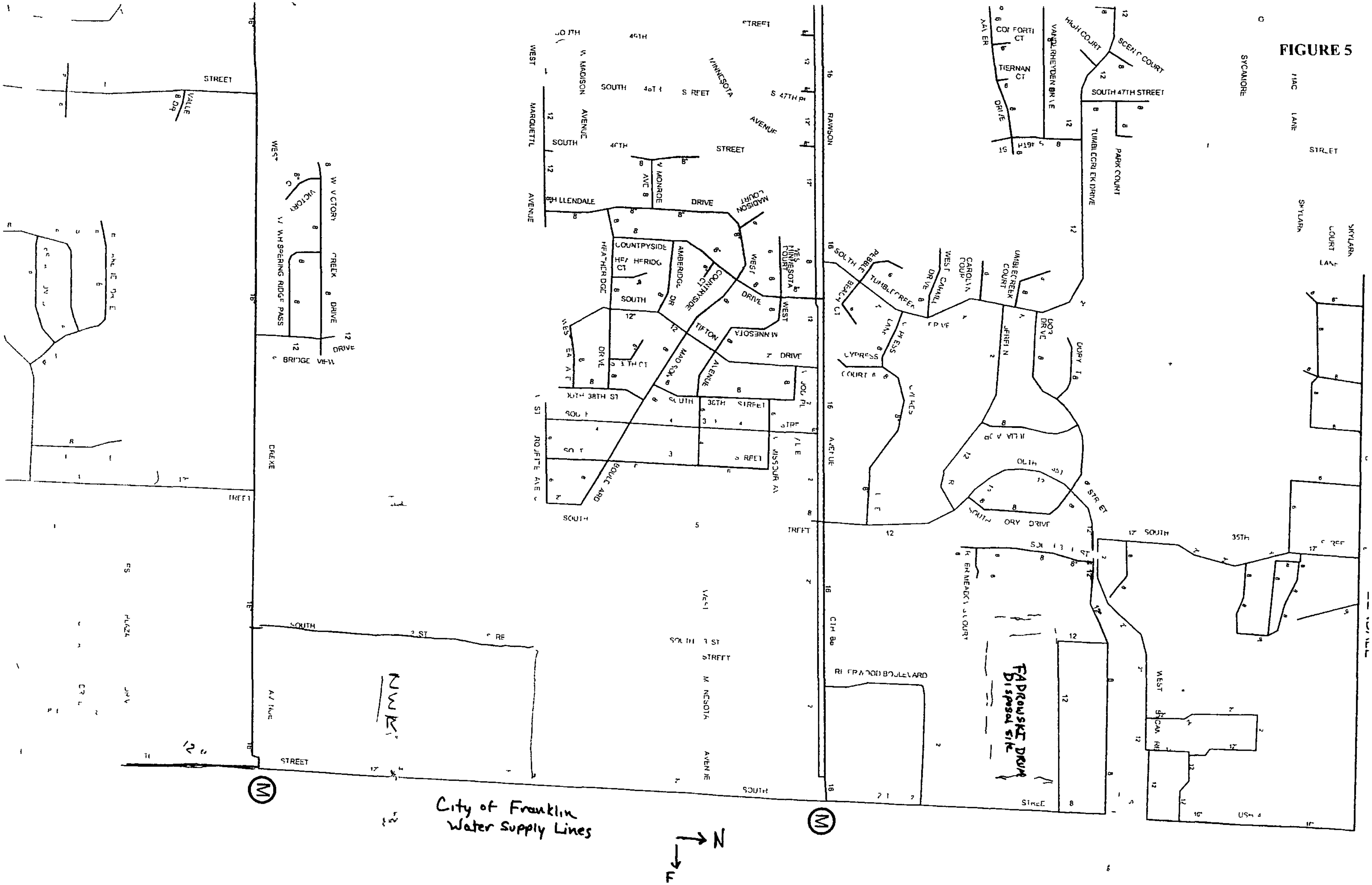

PAGE 8
OUTLOT 1 -0007
LOT 1 -9974 -004
Old Mercies
Ashley Home Furnishings
Condos
Meander Line
Fence Line
Unnamed Tributary
Fadrowski Drum Disposal
1 inst 5 tc
11 trucks
OL 1 9974 005
LOT 3 9975 006
LOT 2 9975 -005
LOT 1 -9975 -004 6865
CSM NO 6168
CSM NO 1316
CSM NO 6810
27TH
CITY OF FRANKLIN LIMITS
CITY OF OAK CREEK LIMITS
C F S N 00°06 34 E 2645 92
RIVER MEADOW CT
LOT 8 -0075 313548 sf
OL 1 -0076
LOT 7 -0074 1118715 sf
LOT 5 -0072 108443 sf
Goodwill Store
LOT 4 -0071 172704 sf
Gander Mt. Store
PARCEL 1 9978 005
RIVERWOOD BLVD
LOT 6 -0073 301,237 sf
LOT 3 -0070 574172 sf
LOT 1 -0068 88813 sf
LOT 2 -0069 75723 sf
OL 2 -0077 387944 sf
OL 3 -0078 178299 sf
MEANDER LINES
℄ of River
RIVERWOOD VILLAGE SUBDIVISION
9984
6842
6854
6864
6801
6919
6939
6941
6960
3306
3307
3320

FIGURE 4

FIGURE 5


City of Franklin
Water Supply Lines
FADROWSKI DRUM
Disposal site
N
RAWSON
SOUTH 47TH STREET
TUMBLECREEK DRIVE
PARK COURT
TIERNAN CT
HIGH COURT
COUNTRYSIDE
AMBERIDGE DR
TIFTON
W MONROE AVE
HILLENDALE
DRIVE
MARQUETTE
AVENUE
CYPRESS
COURT
STREET
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ATTACHMENTS

Attachment 1 - Letters regarding WDNR and EPA approval of WACLs
Attachment 2 - WDNR Solid Waste Technical Guidance for calculating PAL/ ACLs
Attachment 3 - Public Notice announcing start of second five- year review
Attachment 4 - Community interview summary and City of Franklin contact list
Attachment 5 - List of Documents reviewed for five- year review
Attachment 6 - Five- year review inspection checklist
Attachment 7 - Photograph log of September 10, 2003 inspection
Attachment 8 - Declaration of Restrictions for the FDDS
Attachment 9 - WDNR Solid Waste Technical Guidance for Reducing or Terminating Groundwater Monitoring
Attachment 10 - Cumulative groundwater data for metals at the FDDS

ATTACHMENT 1

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

RECEIVED
AUG 1 8 2003
AYRES ASSOCIATES

REPLY TO THE ATTENTION OF

SR-6J

August 13, 2003

Mr. Paul Mahler
Corporate Counsel
Menards, Inc.
5136 Old Mill Plaza
Eau Claire, WI 54703-9625

VIA TELEFAX AND FIRST CLASS U.S. MAIL

RE: Proposed Alternate Concentration Limits for the Fadrowski Drum Disposal Superfund Site, Franklin, Wisconsin

Dear Mr. Mahler:

This letter regards the Alternate Concentration Limits (ACLs) which were proposed in the Draft Five Year Statistical Evaluation Report ("the Report") for the Fadrowski Drum Disposal Site (FDDS). The Report was prepared by Ayres & Associates, Inc. (Ayres) on behalf of Menard Inc. in December 2002 and was subsequently revised in June 2003 as per the comments submitted by the Wisconsin Department of Natural Resources (WDNR) and the U.S. Environmental Protection Agency (EPA) ("the Agencies") on May 2, 2003. The Agencies had several discussions with Ms. Lori Rosemore of Ayres since that time and e-mailed additional comments on the Report to Ayres on July 10, 2003. We are awaiting the final revisions to the Report as per the discussions and comments.

In the above-referenced Report, Ayres, on behalf of Menard, Inc., requested that the Agencies grant an exemption for exceeding the Preventive Action Limits (PALs) and Enforcement Standards (ES) under Chapter NR 140 Ground Water Quality Standards of the Wisconsin Administrative Code (WAC) and Chapter NR 507 Environmental Monitoring for Landfills, WAC. In conjunction with this request, Ayres proposed Wisconsin ACLs (WACLs) for the monitoring wells (MW): MWs 8CO and 9S for fluoride; MWs 6COR, 6S and 7S for iron; and MWs 6COR, 6S, 8CO, 8D and 9S for manganese, pursuant to subChapters NR 140.28 and NR. 507.29.

The Remedial Action Scope of Work for the FDDS, dated January 13, 1993, stipulated that WACLs could only be considered for a particular contaminant in accordance with NR 140.28, WAC, if EPA determines that it is not economically or technically feasible within the meaning of NR 140.28, WAC, to achieve one or more of the PALs. The Agencies find that after fifteen

groundwater monitoring events, Menard, Inc. has sufficiently demonstrated that: 1) the background groundwater quality standards exceed the PAL/ES of NR 140; and 2) it is neither economically nor technically feasible to attain the PAL/ES for fluoride, iron and manganese for the above-cited MWs within the meaning of NR 140.28, WAC, 1988. The Agencies are hereby granting an exemption pursuant to subChapter NR 140.28, WAC, 1988 to exceed the PAL/ES for fluoride (0.44 mg/l), iron (0.15 mg/l) and manganese (0.025 mg/l).

Further, the WACLs for the monitoring wells specified in the attached letter of July 29, 2003 from WDNR to EPA have been approved by the Agencies. Please note that these approved WACL values differ from those proposed in the Draft Five-Year Statistical Evaluation Report of June 2003 due to rounding differences. According to Ms. Rosemore, the Report is being revised to reflect the WACL values in the attached letter, which will be included as an appendix to the Report. Please refer to the attached letter for specific details regarding the exemption and approval of the WACLs for the FDDS.

Regarding other Site-related activities, a Final Close Out Report (FCOR) was signed on August 6, 2003 for the FDDS. I have attached a copy for your files. The FCOR is a prerequisite to the deletion of a site from the National Priority List. A Notice of Intent to Delete and a Notice of Deletion have also been prepared for the Site and are currently being reviewed by EPA Headquarters staff.

The Agencies will also be conducting a statutory Five-Year Review at the FDDS in the near future in order to complete a Five-Year Review Report by September 30, 2003. We will contact Ayres to arrange for a Site visit. In the mean time, I look forward to receiving the final Five Year Statistical Evaluation Report in the near future.

If you have any concerns or questions regarding this letter or the attachments, please do not hesitate to contact me at (312) 886-5251.

Sincerely,

Sheila A. Sullivan

Sheila A. Sullivan
Remedial Project Manager
U.S. EPA, Region 5

Attachments (2)

cc: L. Rosemore, Ayres Associates (w/att.)
J. Anklam, Ayres Associates (w/att.)
B. Amungwafor, WDNR (w/att.)
L. Meyers, WDNR, Bureau of Legal Services (w/att.)

WISCONSIN
DEPT. OF NATURAL RESOURCES

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Jim Doyle, Governor
Scott Hassett, Secretary
Gloria L. McCutcheon, Regional Director

Southeast Region Headquarters
2300 N. Dr. Martin Luther King, Jr. Drive
PO Box 12436
Milwaukee, Wisconsin 53212-0436
Telephone 414-263-8500
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July 29, 2003

FID # 241376520

SFND

Milwaukee Co.

Ms. Sheilla A. Sullivan

Remedial Project Manager
U.S. EPA Region V
77 W. Jackson Boulevard
Chicago, IL 60604-3590

RE: Groundwater Monitoring Program, Five-Year Statistical Evaluation Report, Fadrowski Drum Disposal Site, Franklin, Wisconsin dated December, 2002.

Dear Ms. Sullivan:
We have completed our review of the above referenced report. In the report, Ayres Associate on behalf of the Responsible Party (RP) requested U.S. EPA in consultation with the Wisconsin Department of Natural Resources (WDNR) to grant exemption for exceeding the Prevention Action Limits (PALs) and Enforcement Standards (ES) for chapter NR 140 groundwater quality standards of the Wisconsin Administrative Code (WAC) and Chapter NR 507 environmental monitoring for landfills, WAC and also proposed Wisconsin Alternate Concentration Limits (WACLs) for the following monitoring wells (MW): MWs 8CO and 9S for fluoride, MWs 6COR, 6S and 7S for iron and MWs 6COR, 6S, 8CO, 8D and 9S for manganese, according to subchapters NR 140.28 and NR. 507.29

The clean-up standards for the Fadrowski Drum Disposal Site (FDDS) are the PALs for chapter NR 140 of the 1988 WAC The Remedial Action Scope of Work (SOW) for the FDDS. dated January 13, 1993 stipulated that WACLs could only be considered for a particular contaminant in accordance with NR 140.28, WAC, if U.S. EPA determines that it is not economically and technically feasible within the meaning of NR 140.28, WAC, to achieve one or more of the PALs. WACLs could not be considered prior to the completion of the five-year Groundwater/Surface Water Assessment Report. WACLs could only be proposed after eight quarters of groundwater were collected.

After fifteen rounds of groundwater sampling events at the FDDS, the RP has demonstrated through the data reported on pages 4-4, 4-5 and 4-6 of the Report that: 1) the background groundwater quality standards exceed the PAL/ES of NR 140; and 2) it is neither economically nor technically feasible to attain the PAL/ES for fluoride, iron and manganese for the above-cited MWs within the meaning of NR 140.28, WAC, 1988.

The WDNR accepts the determination that background, groundwater quality standards are above the PAL/ES for fluoride, iron and manganese and that this may be due to natural occurrence for these substances. The background, groundwater quality standards for fluoride, iron and manganese are higher than those at the waste management boundary which is the edge of the completed cap. Monitoring Wells installed as close as possible to the edge of the cap are used to monitor compliance with clean-up standards.

The WDNR grants an exemption according to subChapter NR 140.28, WAC, 1988 for exceeding the PAL/ES of : fluoride (0.44 mg/l), iron (0.15 mg/l), and manganese (0.025 mg/l). The WDNR approves ACLs for the following MWs:

MWs	Parameter	Mean Concentration	PAL/ES	Calculated ACLs	Rounded ACLs
MW-8 CO	Fluoride	0.74 mg/l	0.44/2.2 mg/l	3.6mg/l	4.0 mg/l
MW-9S	Fluoride	1.3	0.44/2.2	1.48	1.5
MW-6COR	Iron	0.05	0.15/0.3	0.347	0.35
MW-6S	Iron	0.10	0.15/0.3	0.303	0.30
MW-7S	Iron	0.06	0.15/0.3	0.372	0.37
MW-6COR	Manganese	0.19	0.025/0.05	0.513	0.51
MW-6S	Manganese	0.15	0.025/0.05	0.235	0.24
MW-8CO	Manganese	0.25	0.025/0.05	0.625	0.63
MW-8D	Manganese	0.04	0.025/0.05	0.056	0.06
MW-9S	Manganese	0.04	0.025/0.05	0.051	0.05

The approved ACLs are to be regarded as PALs within the waste boundary which is the edge of the cap. Outside the waste management boundary, an ACL is to be treated as a PAL if it is less than the NR 140 enforcement standard, otherwise it acts as an ES except in cases where the background concentration is higher than the ES, as is the case at the FDDS.

Paragraph 5 (Clean-up Standards) of the Remedial Design SOW, dated September 25, 1991 specifies that: "Additionally, cleanup standards consistent with the National contingency Plan and the Record of Decision may be specified by the U.S. EPA, in consultation with WDNR , for other contaminants detected during monitoring that lack a NR 140 numeric standards". The WDNR would like to make it clear that other contaminants detected during the monitoring that lack NR 140, WAC, 1988 numeric standard should be defaulted to the current NR 140, WAC standards.

If you have any questions concerning the PALs exemption and ACLs approval, please contact me at 414-263-8607.

Sincerely,

Binyoti Amungwafor
Hydrogeologist.

CC: Case File.

ATTACHMENT 2

SOLID WASTE TECHNICAL GUIDANCE
PAL/ACL CALCULATIONS

Filename: WA026.doc

Summary: This guidance is written for use by facility owners and operators and DNR Staff to calculate Preventive Action Limits (PALs) and Alternative Concentration Limits (ACLs) for solid waste facilities under chs. NR 507 and NR 140, Wis. Adm. Code. It replaces the previous DNR Guidance SW9400015 dated May 6, 1994. The topics covered in this guidance include:

- Groundwater quality standards
- Assembling and evaluating baseline groundwater quality data
- Calculating PALs for indicator parameters
- Calculating ACLs for public health and welfare parameters
- Interpreting data from impacted wells

This guidance may be useful in the preparation and review of feasibility reports, plans of operations, groundwater monitoring plan modifications, or exemption requests to the groundwater standards under s. NR 140.28.

Guidance manager/contact: Barb Hennings - WA/3
Environmental Monitoring Team (EMT)

Groundwater Standards

Wisconsin's groundwater standards are set at two levels: an **enforcement standard (ES)** which is usually the same as the federal drinking water standard, and a lower **preventive action limit (PAL)** which triggers the need for remedial response or other action at a facility. In cases where the **background** concentration of a substance of public health or welfare concern exceeds either a PAL or an ES, the Department may establish an **alternative concentration limit (ACL)**. The ACL replaces a PAL, an ES, or both, when an exemption to the published standard is granted in accordance with s. NR 140.28. Standards for most public health and welfare substances are published in ch. NR 140, Wis. Adm. Code. PALs for indicator parameters and ACLs are determined from the baseline groundwater monitoring data as explained in this guidance.

- The ES and PAL values for substances of **public health** concern are listed in s. **NR 140.10, Table 1.**
- The ES and PAL values for substances of **public welfare** concern are listed in s. **NR 140.12, Table 2.**
- PALs for **indicator parameters** are calculated based on the greater of the following:
  The background water quality for that parameter plus 3 standard deviations, **or**
  The background water quality for that parameter plus the increase for that parameter listed in s. **NR 140.20, Table 3.** Indicator parameters do not have enforcement standards.
- ACLs for public health and welfare parameters (other than VOCs) are calculated based on historical data for each well as outlined in the following guidance.

The **confirmed exceedance** of a PAL, ES or ACL at any groundwater monitoring well requires responses from the owner of the facility in accordance with s. NR 508.04 Wis. Adm. Code. A confirmed exceedance at a designated **Subtitle-D well** triggers an **assessment monitoring** program for the Subtitle-D wells (s. NR 508.05, Wis. Adm. Code) in addition to the responses under s. NR 508.04, Wis. Adm. Code. For further information on assessment monitoring see Waste Management guidance # WA007.

When are PAL calculations for indicator parameters submitted?

For **existing** solid waste disposal facilities, the owner or operator submits indicator PAL calculations at the direction of the Department. Applicants for **proposed** solid waste disposal facilities (including proposed expansions) must submit indicator PAL calculations prior to (or as part of) the **plan of operation**.

When should a facility owner or operator request an exemption and propose an ACL?

A facility owner or operator may request an exemption from the groundwater standards if the **background concentration** (see NR 140.05(3), Wis. Adm. Code) of a public health or welfare parameter exceeds the NR 140 PAL or ES (see NR 140.12, Wis. Adm. Code).

Unless the Department grants an exemption, it may not approve a proposed facility, practice or operation at a location where a PAL or ES is exceeded. For an existing facility, a response under s. NR 140.24(2) or 140.26 (2), Wis. Adm. Code, is required unless an exemption is granted.

An exemption request to the groundwater standards may be submitted as a plan modification, or may be required as part of a feasibility report for a proposed facility. (see s. NR 512.13 (4) (b), Wis. Adm. Code) Under s. NR 507.29 (1), Wis. Adm. Code, an exemption request must contain:

a. A list of the specific wells and parameters for which an exemption is being requested.
b. Proposed ACLs and calculations in accordance with s. NR 507.27. **(see exception below)**
c. A discussion of how the criteria listed in s. NR 140.28(2)(3) or (4) are met.

Exception: For proposed facilities, including proposed expansions, the proposed ACLs and calculations may be submitted with the plan of operation. A minimum of 8 samples for each well and substance is recommended to calculate an ACL. However, only the initial 4 sample rounds are required to be submitted with a feasibility report. Thus, while the exemptions to the groundwater standards must be granted in the feasibility determination, the ACL cannot usually be calculated until the plan of operation is submitted.

Steps for facility owners to use in calculating PALs for indicator parameters and ACLs for public health and welfare parameters

1. Assemble the available groundwater monitoring data for the required baseline and detection monitoring parameters at each well. Use the entire set of analyses available for a given well and parameter. The larger the data set, the more accurate predictor the PAL will be. According to ss. NR 140.20, Wis. Adm. Code, you must have **at least** 8 background values to calculate PALs for indicator parameters. Similarly, the Department recommends that a minimum of 8 background values be used for calculating ACLs for public health and welfare parameters, other than VOCs.

2. Insure that the data lists include all of the parameters required for baseline and detection monitoring at your facility:
   a. For **municipal and industrial waste landfills,** the required parameters are listed in ch. NR 507, Wis. Adm. Code as follows:
      i. Detection monitoring parameters except VOCs (see NR507.18(1) and NR 507 Appendix I, Tables 1 and 2)
      ii. Public health and welfare parameters not included as detection monitoring parameters (see NR 507.18(2) and NR 507 Appendix I, Table 3.)
      iii. VOCs (see NR 507.18(3) and NR 507 Appendix III)
   b. The required parameters for **small size construction and demolition waste landfills** are found in s. NR 503.09, Table 1.

c. The parameters for **intermediate size construction and demolition waste** landfills are found in s. NR 503.10, Table 3.

Attachment # 2 in this guidance contains a checklist of parameters and the minimum number of rounds required. Note that conditions may require monitoring for substances in addition to those listed in the code.

Present in tabular form all baseline groundwater quality monitoring results and any other relevant groundwater monitoring data in your submittal. Include the concentration, date of sampling and an indication of whether that value has been eliminated from the calculations. Generally the Department will not accept the use of computer programs to reject outliers. If you wish to use such a program, check with the Department staff first.

3. **Evaluate the data quality.** Evaluate the data and any supporting documentation to determine which data are usable for PAL/ACL calculations, and for ACL requests, whether the data supports the need for an ACL. Data used in the PAL/ACL calculations must have been collected using published sampling procedures and generated at a DNR certified lab using acceptable methods. The data should be representative of baseline conditions and be scientifically valid. Please refer to **Attachment 5** for more detail regarding the following considerations.

   a. Evaluate the field procedures and whether sample handling and preservation affect the data quality.
   b. Determine if the analyses were performed by a certified laboratory.
   c. Evaluate whether the facility selected appropriate methods of analysis: The goal of method selection is to use a procedure that reliably determines whether the concentrations in the groundwater exceed the PAL. Not all laboratories or methods can achieve the NR 140 PALs. The Department is aware of several substances that have been problematic. These substances are identified in Attachment 5.
   d. Evaluate causes of high sample variability.
   e. Determine whether there is valid justification for the elimination of any background data that were not used in the PAL or ACL calculations.

4. **Calculate PALs** for indicator parameters.
   a. Calculate the mean concentration plus 3 standard deviations for each indicator parameter and well. For duplicate samples, use duplicate number 01, unless there is a justifiable reason for rejecting it and using duplicate number 02. If the concentration of a substance is less than the limit of detection (LOD), a value of one-half the LOD should be used as the value for that sampling event, provided that the LOD is sufficiently low as discussed in the data quality section.
   b. Calculate the mean plus the NR 140.20 Table 3 increment.
   c. Choose the greater of either (a) or (b) for the selected parameter. Round the result up to the nearest two significant figures. For example, a value of 123.49 would be rounded up to 130.
   d. Present the calculated PAL for each well and parameter in a table or chart that includes the mean, standard deviation, PAL using 3 standard deviations, PAL using the NR 140 Table 3 increment, and the selected PAL. (see Attachment 6)

5. **Determine if any wells and parameters will need exemptions and ACLs.** For public health parameters and welfare parameters, exemptions are considered where the background groundwater quality data for a well and parameter is unaffected by a release from the facility, and 4 representative monitoring results meet one or more of the following criteria:
   a. Any of the values exceeds an ES, or
   b. Two or more of the values exceed a PAL, or

c. The average of the values is greater than the PAL.

Note that parameter concentrations must be above the LOQ to be considered an exceedance unless there is sufficient data to demonstrate the exceedance statistically with a significance level of 0.05 (NR 140.14(3)). If all detected results for a monitoring parameter are below the LOQ for the analyses, these concentrations do not exceed the PAL or ES for that parameter so an ACL is unnecessary.

6. **Calculate ACLs** for specific wells and parameters where appropriate. Normally, at the feasibility report stage there will not be a sufficient number of baseline samples available to calculate an ACL.
   a. For each well and parameter (other than VOCs), calculate the mean concentration of at least 8 sampling events plus 2 standard deviations. For duplicate samples, use duplicate number 01, unless there is a justifiable reason for rejecting it and using duplicate number 02. If the concentration of a substance (other than VOCs) is less than the limit of detection (LOD), a value of one-half the LOD should be used as the value for that sampling event provided, of course, that the LOD is sufficiently low as discussed in the data quality section. For example, if the result for a sampling event of lead was listed as "no detect" and the LOD was listed as 0.4 micrograms/liter, then the value used for that sampling event should be one half of the LOD or 0.2 micrograms per liter.
   b. Present the information for each well and parameter in a table or chart that includes the mean, standard deviation and proposed ACL.
   c. Include an exemption request which contains the ACL calculations and fully explains the origin of the exceedance(s) and why the criteria of s. NR 140.28 are met.

   The Department may, using professional judgement, establish an ACL for specific VOCs if a NR 140.28 exemption request is granted. If there is an ACL exceedance, the Department will use professional judgement to decide what action is appropriate for that exceedance. The Department will not accept ACL calculations for Volatile Organic Compounds (VOCs).

7. **Submit the PAL/ACL calculations and/or exemption request(s)** to the appropriate DNR Regional Office. As noted above, the document may be submitted as a groundwater monitoring plan modification request or may be required as part of a feasibility report or plan of operation for a proposed new or expanded facility. PAL/ACL calculations and NR 140.28 exemption requests must be submitted under the seal of a registered professional geologist. Upon receipt of the submittal, the Department will send an invoice for the appropriate review fee. (see NR 520 Table 3) The DNR hydrogeologist assigned to the facility will review the submittal and decide if the PAL/ACLs are approvable. If so, the PALs/ACLs will be established as groundwater standards in the facility's plan of operation.

III. IMPACTED WELLS

IDENTIFICATION OF IMPACTED WELLS

A well is considered "impacted" if it has high concentrations of one or more substances when compared to other wells screened in the same geologic formation or exceedances of the groundwater standards in ch. NR 140, Wis. Adm. Code. The high concentration or exceedance may be due to several factors, including: a release from the facility, a release from an adjacent facility, prior land uses, or elevated natural background concentration of a substance.

Owners of some facilities, particularly those located in a fine-grained soil environment, may decide to calculate ACLs rather than use the established PALs for public health and welfare parameters because of high background levels reflecting natural impacts. Those facilities must provide adequate justification for

an NR 140.28 exemption when requesting the ACLs so that the Department can determine whether the high levels are natural background or the result of a release.

One or more of any of the following methods or tools may be used to identify impacted wells. The Department is willing to review other valid means of identification which you provide.

1. **Prior Investigation**

A well may have been identified as impacted during an investigation. Again, be sure to check if the well has been impacted for all parameters from the time of installation or if at least 8 rounds of "clean" data are available to calculate a PAL or ACL.

2. **Box Plots**

You may construct non-parametric box plots using all data for each parameter at each well; see attachments 7 and 9 for further information about box plots. For easy comparison with a "clean" well, include a background well on each set of box plots. Past experience has shown us that the "clean" range is generally within ±5NP (nonparametric) units of the median of data from all wells on site, where the site-wide median is shown as "0" on the horizontal axis of the box plots.

If box plots indicate that the well appears impacted, you can inspect the time vs. concentration plots, determine if there is a period of time for which you have at least 8 rounds of "clean" data available and decide whether those values represent the background.

Attachment 9 shows both the time vs. concentration plot and box plots for field conductivity data at 4 wells. Used together, box plots and time vs. concentration plots aid in the interpretation of water quality data. Attachment 9 illustrates how an impacted well (MW-2) appears on both a box plot and time vs. concentration plot. Note that the box plot for well MW-2 is greater than 5 NP units from the median.

3. **Time vs. Concentration Graphs**

Construct time vs. concentration graphs as shown in Attachment 8 using all data for each parameter at each well. Use no more than 3 downgradient and 1 upgradient well on each plot to avoid clutter. The upgradient well will most likely be a flat line representing a low concentration through time. The side- or downgradient wells might be any combination of flat and/or positive or negative slopes. You may note the dates of significant events such as cover placement or the opening of a new phase on the plot. Use the plots to find the period of time during which the samples most representative of background were collected. Calculate the PAL and/or ACL using those representative values, of which there must be at least 8.

Use professional judgement to decide whether a well is so impacted that PALs cannot be calculated. Attachment 9 illustrates data for well MW-2 which appears to be impacted by a release(s) from the facility. If you have such wells, submit a brief justification for the way you established the PAL.

4. **Linear Regression**

Linear regression, a parametric statistic, can help you decide whether there is an increasing concentration with time; however, it assumes a **normal distribution** for the data set. That assumption is **usually not valid** for groundwater samples. The Department will accept use of linear regression as evidence of impacted groundwater only if there is a normal distribution as determined by using a skewness test. (See "Methods for Determining Compliance with Groundwater Quality Regulations at Waste Disposal

Facilities" dated January, 1989, by S. Fisher and K. Potter for skewness methodology.) This document is available from the Bureau of Waste Management upon request.

5. **Maps**

Plan view maps of the facility with the concentration of the parameter of interest noted next to the well will provide locational information which may help you decide how to handle an apparently impacted well. Be sure to include only wells which terminate in the same geologic formation or at the same elevation. Note, too, the well locations in respect to any possible contamination sources other than the waste mass itself. Contouring and color coding the concentration ranges can be a good visual tool. Preparation of such maps at several elevations, along with flow nets, cross sections, and fence diagrams will provide 3-dimensional insight to any impacts.

HOW TO CALCULATE PAL/ACLs FOR IMPACTED WELLS

NOTE: *A well may be impacted for one parameter and not for others. Be sure to check all parameters.*

1. Calculate the PAL using both the first 8 (unimpacted) points representative of background and the entire data set. Compare the results and use the smaller of the two numbers as the PAL.

2. If all data for a parameter, not just recent data, are impacted (and since by definition a PAL cannot be calculated at such a well):

   a. Use the PAL calculated at an upgradient well which is screened in the same formation, or

   b. If an upgradient well is not screened in the same formation:

      i. find another uncontaminated well which is appropriately screened, as it will probably have similar water quality, and use the PAL for that well, or

      ii. use the PAL for a well with similar water quality, as indicated by box plots with similar medians and confidence intervals for **other** parameters.

      NOTES: *You may use a well that is part of an adjacent facility's monitoring system only if it meets the above criteria better than any of the subject facility's wells.*

      DO NOT merge data from monitoring wells and private wells because these well types are constructed and sampled so differently.

   c. Calculate an indicator PAL using the impacted data and provide adequate justification for its use (i.e. the upgradient well is downgradient of an adjacent unlined facility).

IV. DEFINITIONS

An **Alternative Concentration Limit** (ACL) is defined in s. NR 140.05 (1m), Wis. Adm. Code, as the concentration of a substance in groundwater established by the department for a site to replace a preventive action limit or enforcement standard or both, from Table 1 or 2, when an exemption is granted in accordance with s. NR 140.28.

Background groundwater quality or background concentration is defined in s. NR 140.05(3), Wis. Adm. Code, as groundwater quality at or near a facility, practice or activity which has not been affected by that facility, practice or activity

Baseline is defined in s. NR 500.03(20) as the groundwater quality at a point that is measured after the parameters have stabilized following installation of a monitoring well.

An **Enforcement Standard** (ES) is defined as a numerical value expressing the concentration of a substance in groundwater which is adopted under s. 160.07, Stats. (establishment of enforcement standards; substances of public health concern), and s. NR 140.10, Wis. Adm. Code, (public health related groundwater standards) or s. 160.09, Stats. (establishment of enforcement standards; substances of public welfare concern), and s. NR 140.12, Wis. Adm. Code, (public welfare related groundwater standards).

An **error log** identifies data points which are eliminated because of a sampling error such as a defective conductivity meter. It may be combined with the nullify log if points are identified by an "e" or "n".

The **limit of detection** is the lowest concentration for an analytical test method and sample matrix at which the presence of a substance can be identified in an analytical sample, with a stated degree of confidence, regardless of whether the concentration of the substance in the sample can be quantified.

The **limit of quantitation** is defined in NR 140.05(13) as the level above which quantitative results may be obtained with a specified degree of confidence.

The arithmetic **mean** for a parameter at one well is the sum of the concentrations divided by the number of values used.

A **nonparametric statistic** is one that does not depend on the data being drawn from any particular distribution, such as a normal distribution.

A **nullify log** identifies data points which are eliminated for a reason other than sampling error, such as high concentration due to well construction. It may be combined with the error log if points are identified by an "e" or "n".

A **Preventive Action Limit** (PAL) is defined in s. NR 140.05(17), Wis. Adm. Code, as a numerical value expressing the concentration of a substance in groundwater which is adopted under s. 160.15, Stats. (establishment of PALs), and either listed in s. NR 140.10 (public health related groundwater standards), or s. NR 140.12 (public welfare related groundwater standards), or calculated under s. NR 140.20 (indicator parameter groundwater standards).

The **standard deviation** for a group of samples is defined in ch. NR 140.20(2), Wis. Adm. Code, as the square root of the value of the sum of the square of the difference between each sample in the sample group and the mean for that sample group divided by the number of samples in the sample group where the sample group has 30 or more samples and by one less than the number of samples in the sample group where the sample group has less than 30 samples.

A **uniform scale** is one which has consistent, non-logarithmic increments.

Legal Note: This document is intended solely as guidance, and does not contain any mandatory requirements except where requirements found in statute or administrative rule are referenced. This guidance does not establish or affect legal rights or obligations, and is not finally determinative of any of the issues addressed. This guidance does not create any rights enforceable by any party in litigation with the State of Wisconsin or the Department of Natural Resources. Any regulatory decisions made by the Department of Natural Resources in any matter addressed by this guidance will be made by applying the governing statutes and administrative rules to the relevant facts.

Attachments:

1. PAL/ACL Calculations
2. Checklist Groundwater Parameters
3. Example Data Presentation Table
4. Example Error Log
5. Evaluating Data Quality
6. Example Calculation Summary
7. Description of GEMS Box Plots
8. Time vs. Concentration Plot
9. Example Impacted Well Plots

Attachment 1

PAL/ACL CALCULATIONS CHECKLIST
August 2001

Bureau of Waste Management
Wisconsin Department of Natural Resources

This checklist is designed to be used in conjunction with the PAL/ACL Calculations Guidance for Solid Waste Facilities. (Guidance # WA___)

1. Assemble the data.
   ____ Acceptable lab procedures
   ____ Acceptable limits of detection
   ____ Has all data been submitted to DNR in the proper electronic data format (diskette)

2. Present baseline groundwater quality results.
   ____ All required parameters (see Attachment #2)
   ____ At least 8 baseline values for calculating PALs or ACLs (exclude duplicate samples)
   ____ Both well name and DNR Well ID# are used to identify the well
   ____ All sample dates and concentrations are reported
   ____ Data not used for calculations are clearly marked

3. Justify the elimination of data
   ____ Valid justification is presented for eliminated data values

4. Calculate Indicator PALs
   ____ Tabular presentation including number of values, means and standard deviations
   ____ Present mean + 3 standard deviations and NR 140 Table 3 incremental increase
   ____ Select and indicate PAL values
   ____ Round "up" and record 2 significant figures

5. Calculate any ACLs
   ____ Tabular presentation including number of values, means and standard deviations
   ____ ACL calculation based on mean + 2 standard deviations
   ____ Exemption request and explain why NR 140.28 criteria are met.

6. Determine which, if any, wells are impacted
   ____ Data presentation
   ____ Justification for elimination of data
   ____ PAL calculation using entire data set and unimpacted data
   ____ Use of alternate wells to provide a PAL is thoroughly explained
   ____ ACL calculations, if needed

Submit the report to the Department (May be part of a Feasibility Report, Plan of Operation or Plan Modification)
____ Signature of a hydrogeologist
____ Submittal includes proposed PALs and any ACLs
____ Submittal includes exemption requests and explanation of how NR 140.28 criteria are met

Attachment 2

BASELINE GROUNDWATER PARAMETERS

See NR 507.18, Wis. Adm. Code for specific requirements

Part I Baseline for Detection Monitoring Parameters - Except VOCs (Minimum of 8 samples - 4 with a feasibility report plus 4 with a plan of operation)			
Waste Type	Parameter # a..l Name	Parameter Type	NR 140 Standard
Municipal Solid Waste (These are required for all sites)	☒ 39036 Alkalinity, total filtered	Indicator	Calculate PAL
	☒ 00940 Chloride	Public Welfare	Table 2
	☒ 00341 COD, filtered	Indicator	Calculate PAL
	☒ 00094 Field conductivity @ 25°C	Indicator	Calculate PAL
	☒ 00400 Field pH	Indicator	Calculate PAL
	☒ 00010 Field temperature	Indicator	Not Calculated
	☒ 72020 Groundwater elevation*	N/A	N/A
	☒ 22413 Hardness, total filtered	Indicator	Not Calculated
Additional parameters for waste types listed in NR 507, Appendix I, Table 2. (Check if applicable)	☐ 00608 Ammonia nitrogen, dissolved	Indicator	Calculate PAL
	☐ 01020 Boron, dissolved	Public Health	Table 1
	☐ 01025 Cadmium, dissolved	Public Health	Table 1
	☐ 00950 Fluoride, dissolved	Public Health	Table 1
	☐ 01049 Lead, dissolved	Public Health	Table 1
	☐ 00631 Nitrate + Nitrite (as N), dissolved	Public Health	Table 1
	☐ 01145 Selenium, dissolved	Public Health	Table 1
	☐ 00930 Sodium, dissolved	Indicator	Calculate PAL
	☐ 00946 Sulfate, dissolved	Public Welfare	Table 2

Part II Baseline for Public Health and Welfare Parameters Not Included as Detection Monitoring Parameters (4 Samples with the feasibility report plus an additional 4 samples with the plan of operation for any well meeting NR 507.18 (2) (b) 1, 2, or 3.)			
Monitoring Wells	Parameter # and Name	Parameter Type	NR 140 Standard
All Monitoring Wells	☒ 01056 Manganese, dissolved	Public Welfare	Table 2
	☒ 00946 Sulfate, dissolved	Public Welfare	Table 2
	☒ 01090 Zinc, dissolved	Public Welfare	Table 2
	☒ 01000 Arsenic, dissolved	Public Health	Table 1
	☒ 01005 Barium, dissolved	Public Health	Table 1
	☒ 01025 Cadmium, dissolved	Public Health	Table 1
	☒ 01030 Chromium, dissolved	Public Health	Table 1
	☒ 01040 Copper, dissolved	Public Health	Table 1
	☒ 00950 Fluoride, dissolved	Public Health	Table 1
	☒ 01049 Lead, dissolved	Public Health	Table 1
	☒ 71890 Mercury, dissolved	Public Health	Table 1
	☒ 00631 Nitrate + Nitrite (as N), dissolved	Public Health	Table 1
	☒ 01145 Selenium, dissolved	Public Health	Table 1
	☒ 01075 Silver, dissolved	Public Health	Table 1
Additional parameters for Subtitle D wells only. (All 6 are required for Subtitle D wells.)	☐ 01095 Antimony, dissolved	Public Health	Table 1
	☐ 01010 Beryllium, dissolved	Public Health	Table 1
	☐ 01035 Cobalt, dissolved	Public Health	Table 1
	☐ 01065 Nickel, dissolved	Public Health	Table 1
	☐ 01057 Thallium, dissolved	Public Health	Table 1
	☐ 01085 Vanadium, dissolved	Public Health	Table 1

Part III Baseline for VOCs (2 Total. Plus an additional 2 VOC rounds at any well with a VOC above the LOD in either of the first 2 rounds. (Submitted with the feasibility report)			
All wells	☒ VOC Scan (See list in NR 507, Appendix III)	Public Health	Table 1

* Under NR 512.09(4)(e), Wis. Adm. Code, stabilized groundwater elevation measurements shall be obtained from each well on a monthly basis for a minimum of 6 months prior to submittal of the feasibility report.

Attachment 3

Example of data presentation showing dates and concentrations for indicator parameters at one well. Note the "N" or Nullify flags which identify values that are not used in the PAL or ACL calculations. These values should be recorded on a log sheet along with the reason for rejection of the values. See Figure 4 for an example of a "nullify log."

Facility Name _____ License Number _____ Monitoring Well W-2 (ID# 002)

Date of Sample	Field Conductivity at 25C MICROMHO	COD, Filtered Mg/l	Total Hardness, Filtered Mg/l	Total Alkalinity, Filtered Mg/l
10/14/1981	700 N	94 N	254 N	253 N
12/11/1981	625 N	110 N	240 N	278 N
03/18/1982	775 N	101 N	272 N	242 N
06/08/1982	600	59	194	198
09/13/1982	475	67	78	24
12/22/1982	450	32	80	36
03/10/1983	445	28	208	210
06/09/1983	370	50	148	152
09/22/1983	410	56	170	170
12/13/1983	390	54	160	164
03/23/1984	250	55	156	156
06/18/1984	260	38	144	142
10/16/1984	180	83.8	104	102
12/28/1984	155	33	104	96
03/20/1985	260	31.7	132	110
06/28/1985	310	39	140	140
09/26/1985	240	46	94	88
12/13/1985	255	16	110	110
03/24/1986	195	23	88	82
06/30/1986	360	49	170	160
09/24/1986	240	42	96	98
12/18/1986	310	25	130	140
03/18/1987	275	25	130	120
06/24/1987	350	27	180	170

Attachment 4

Example of an error and nullify log. Note that the "comment" column specifies the reason for excluding the point from the PAL or ACL calculation.

Facility Name: _____		License Number: _____		
Reviewer: _____		Date: _____		
Well Number	Parameter	Sample Date	Sample Result	Comments
002	COD	10/14/1981	94.0	Initial high value due to well construction
002	COD	12/11/1981	110.0	Initial high value due to well construction
002	COD	03/18/1982	101.0	Initial high value due to well construction
002	Alkalinity	10/14/1981	253	Initial high value due to well construction
002	Alkalinity	12/11/1981	278	Initial high value due to well construction
002	Alkalinity	03/18/1982	242	Initial high value due to well construction
002	Hardness	10/14/1981	253	Initial high value due to well construction
002	Hardness	12/11/1981	278	Initial high value due to well construction
002	Hardness	03/18/1982	242	Initial high value due to well construction
003	Field Cond.	06/08/1982	1425	Well near salt storage area, flushed out

Attachment 5

Evaluating the Data Quality

Evaluate the data and any supporting documentation to determine which data are usable for PAL/ACL calculations and, for ACL requests, whether the data supports the need for an ACL. Data used in the PAL/ACL calculations must have been collected using published sampling procedures and generated at a DNR certified lab using acceptable methods. The data should be representative of baseline conditions and be scientifically valid.

a. Evaluate the field procedures and whether sample handling and preservation affect the data quality: For parameters that require field filtration, consider whether there were any delays between sample collection and filtration. For VOCs, consider the length of time and how samples were handled between sample collection and delivery to the laboratory. If VOC samples foamed or effervesced during acid preservation, an alternate preservative should have been used or, if the no chemical preservative was added, the sample holding time is reduced to 7 days. If contaminants are detected in field blanks, determine their source and the effect on the sample results. Boron results may be biased high from sample contact with glass or the preservative. (e.g. acid shipped to the field in glass ampules).
b. Analysis by a certified laboratory: Verify that the analyses were generated in a Wisconsin-certified laboratory and that the laboratory held the appropriate certifications for the parameters it analyzed. The laboratory should be able to provide a copy of its certificate, which lists test categories and parameters. This Department posts lists of certified laboratories on its web site: www.dnr.state.wi.us/org/es/science/lc .
c. Selected appropriate methods of analysis: The goal of method selection is to use a procedure that reliably determines whether the concentrations in the groundwater exceed the PAL. There are three considerations in method selection:
    i. The method is approved in rule or by the Department. Appendix II in NR 507 lists analytical methods; however, these references are dated. The Department may approve additional alternative methods for monitoring parameters per NR 507.17 (4) and NR 149.12. EPA-approved methods for water analyses are acceptable for baseline monitoring per NR 149.12(1) provided they are suitable for quantitative analysis (not screening methods or qualitative determinations). In addition, the Department has approved fluorescence methods for mercury as an emerging technology pursuant to NR 149.12(2) in several laboratories. A list of laboratories with approved alternate mercury procedures can be found at www.dnr.state.wi.us/org/es/science/lc/info/Hg_low.htm. If you have a question whether a method is approved or accepted, contact the Department.
    ii. The method is appropriate for the analyte concentration in the sample. The method selected for the analysis should be capable of quantifying sample concentrations (i.e. concentrations are above the LOQ) below the PAL; however, insisting on low detection limits for samples with high analyte concentrations or matrix interferences may compromise data quality.
    iii. The method has sufficient sensitivity. When sample concentrations are low, the method must be capable of quantifying sample concentrations below the PAL. If approved methods are incapable of quantifying sample concentrations below the PAL, the method selected must produce the lowest available LOD and LOQ (NR 140.16 (2)). If substances are reported with concentrations between the LOD and LOQ and this is the result of sample dilution, the facility owner or consultant should request that the laboratory report results for the affected substances from a lesser dilution. If this is not possible, the facility owner or consultant should document why quantifiable results could not be obtained.

It may not be possible to achieve the NR 140 PAL for the following VOCs:

Substance	CAS Number	PAL (µg/L)	Target LOD (µg/L)
Bromodichloromethane	75-27-4	0.06	0.2
1,3-Dichloropropene			
cis	10061-01-5	0.02	0.2
trans	10061-02-6	0.02	0.2
1,1,2,2-Tetrachloroethane	79-34-5	0.02	0.2
Vinyl chloride	75-01-4	0.02	0.2

Although not all laboratories can achieve the target LODs listed above, several certified laboratories are capable of determining these substances at concentrations below this target. Facilities should consider these target LODs when selecting and contracting with a laboratory and evaluating the data.

For several metals, the methods listed in Appendix II may be sensitive enough to quantify sample results below their PALs; however, this is highly dependent on the laboratory's instrument and how they perform the method. Frequently, the PALs fall between the LODs and LOQs for arsenic, cadmium, lead and selenium. It may take special handling (e.g. concentrating samples) to achieve lower LOQs. EPA has approved ICP-MS methodology, which is capable of detecting and quantifying metals below their PALs routinely. The Department will accept results generated using EPA-approved ICP-MS methods EPA 200.8 or SW-846 method 6020, or equivalent ICP-MS methodology. The table below lists the metals that are potentially problematic with estimated LODs for each technique.

		*Range of Quantitation Limits**			
Substance	PAL (µg/L)	ICP	GFAA	Hydride	ICP-MS
Antimony	1.2	3 - 20	3 - 12	3	0.06 - 2.5**
Arsenic	5	5 - 20	2 - 10	6	0.1 - 3**
Cadmium	0.5	0.15 - 1.2	0.15 - 1.2	--	0.03 - 0.7
Lead	1.5	2 - 10	0.4 - 10	--	0.05 - 2.1
Thallium	0.4	7 - 20	1.5 - 10	--	0.03 - 0.15
Selenium	10	5 - 30	2 - 5	3	0.35 - 8

		CVAS	P&T Fluorescence	Fluorescence
Mercury	0.2	0.02 -0.2	0.0002 - 0.001	0.001 - 0.015

*Estimated quantitation limits are based on actual data reported except for hydride which is based on method references. Individual lab performance may vary.
**The upper range for ICP-MS is higher than normally expected but was reported with samples.

d. Evaluate causes of high sample variability: High sample variability between sampling events may indicate problems with data quality or quantity. The facility owner or consultant should evaluate whether sampling, sample handling, or analytical procedures are contributing to the variability. If the groundwater has a high intrinsic variability, it may be necessary to collect more than the required number of samples to obtain a reliable PAL/ACL.
e. Determine whether there is valid justification for the elimination of any background data which were not used in the PAL or ACL calculations. This could include initial high values due to well construction, sampling error, laboratory error, reporting error, matrix interference or high field or method blank readings. Results may be biased low if matrix interferences are present or dissolved parameters are not filtered appropriately. The facility owner or consultant should document why any data are eliminated.

Attachment 6

Example of a chart showing the number of sample results used, mean, standard deviation, mean + 3 standard deviations, the mean + "Minimum increase" and the selected PAL for a single parameter at all wells.

Parameter: Total Alkalinity, filtered
NR 140 Minimum Increase: 100 mg/l

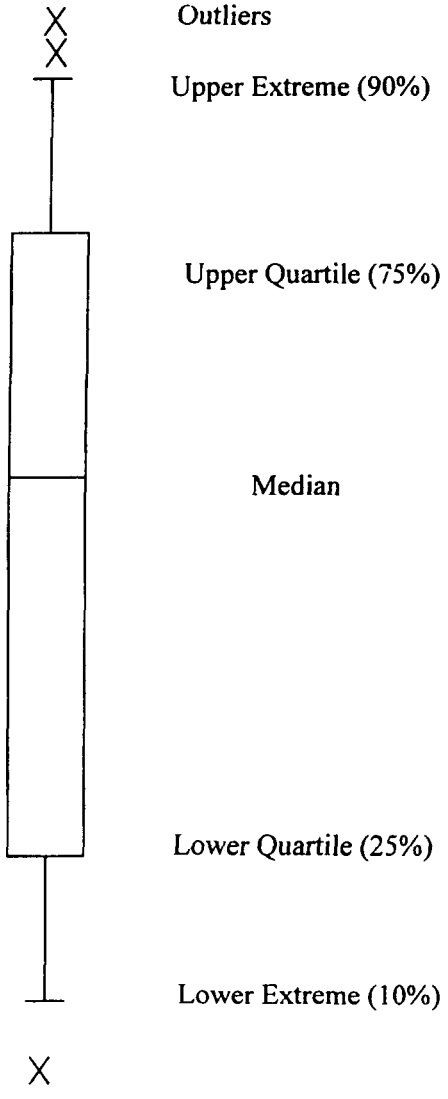
Well (D: R #)	No of Samples	Mean	Std. Dev.	3 X Std. Dev.	Mean + 3 Std. Dev.	Mean + Minimum Increase	PAL
MW 1 (001)	8	257	51	152	409	357	410
MW 1P (002)	8	117	18	54	171	217	220
MW 2 (003)	8	139	19	58	197	239	240
MW 2P (004)	8	116	23	70	186	216	220
MW 3 (005)	8	187	33	99	286	287	290
MW 3P (006)	8	121	25	74	194	221	230
MW 6 (009)	8	124	16	48	172	224	230
MW 6P (010)	8	189	30	91	279	289	290
MW 7 (011)	8	190	15	45	235	290	290
MW 7P (012)	8	147	16	47	194	247	250
MW 16 (041)	8	212	22	65	277	312	320
MW 17 (042)	8	143	18	55	198	243	250
MW 17P (043)	8	96	51	153	249	196	250
MW 18 (044)	8	235	21	62	297	335	340
MW18P (045)	8	152	20	59	211	252	260
MW 19 (046)	8	196	15	46	242	296	300
MW 19P (047)	8	134	27	80	214	234	240
MW 20 (048)	8	187	8	24	211	287	290
MW 21 (049)	8	214	10	31	245	314	320
MW 22 (050)	8	237	27	82	319	337	340
MW 25 (055)	8	198	13	40	238	298	300
MW 26 (056)	8	205	19	56	261	305	310
MW 27 (057)	8	94	12	37	131	194	200
MW 28 (058)	8	117	17	52	169	217	220

Attachment 7

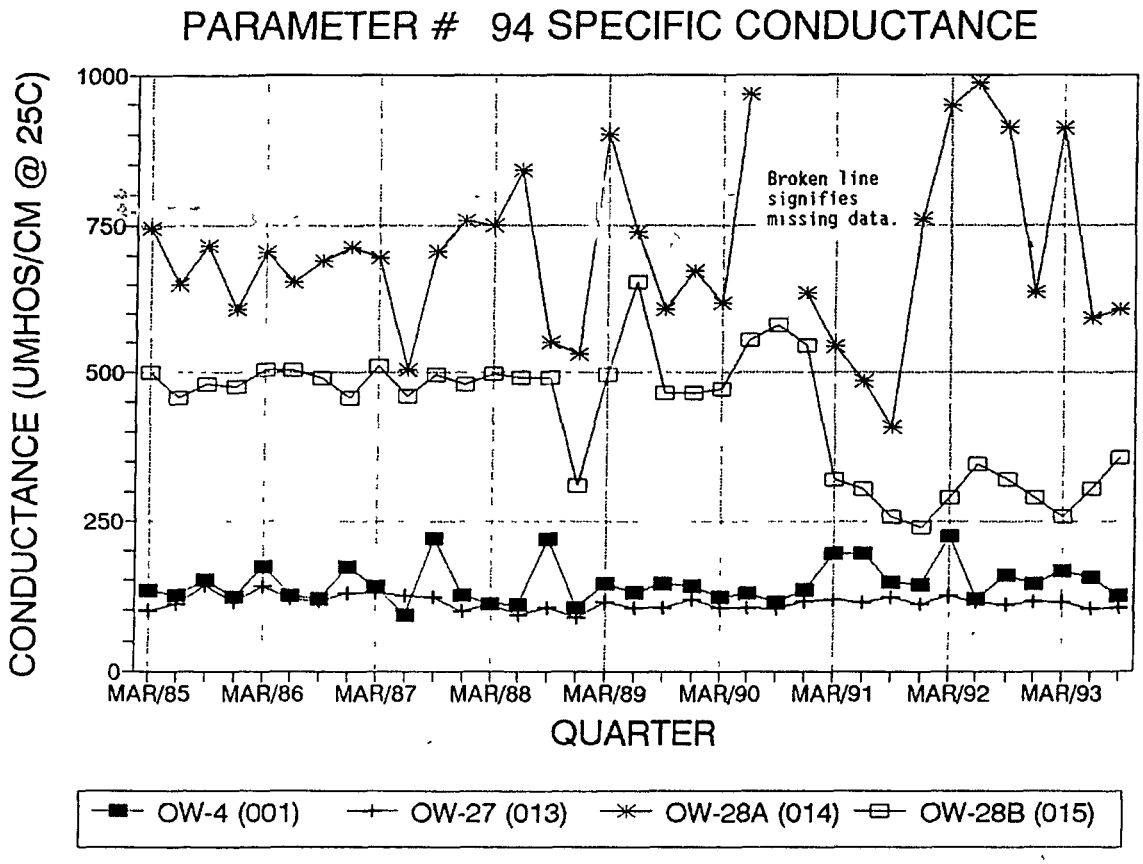
Description of GEMS Box Plots

Box plots can be an effective way to transmit a large amount of information in a small amount of space. At least five sample data are required to produce a box plot. A box plot consists of a **median value** for the data, the **box** containing 50% of the data values with the top line at 75% of the data and the bottom line at 25%. The **whiskers** are drawn to include from 10% to 90% of the data points and the outlier stars represent data outside of this distance.

The Department uses a non-parametric scale that allows different parameters to be compared with each other, even though their units might not be the same. (See Attachment 9) This system puts zero NP (non-parametric) value as the site median for the parameter and adjusts the values of the parameter to a non-parametric value. The site median is a rough indicator of the site background for the parameter, although be aware that the whole site could be above the NR 140 PAL. The "clean" range is considered to be 0 plus or minus 5 NP units, although if individual box plots deviate from the majority they should be investigated. Deviations greater than 5 NP units indicate likely contamination. If the box extends beyond 5 NP units the well should be investigated further. Large interquartile (box) sizes mean that there is a lot of variation in the data for the well and is often characteristic of a well with contamination. Box plots of wells with similar water quality have overlapping confidence intervals. That is the medians and 95% confidence intervals of these wells are usually similar to one another.

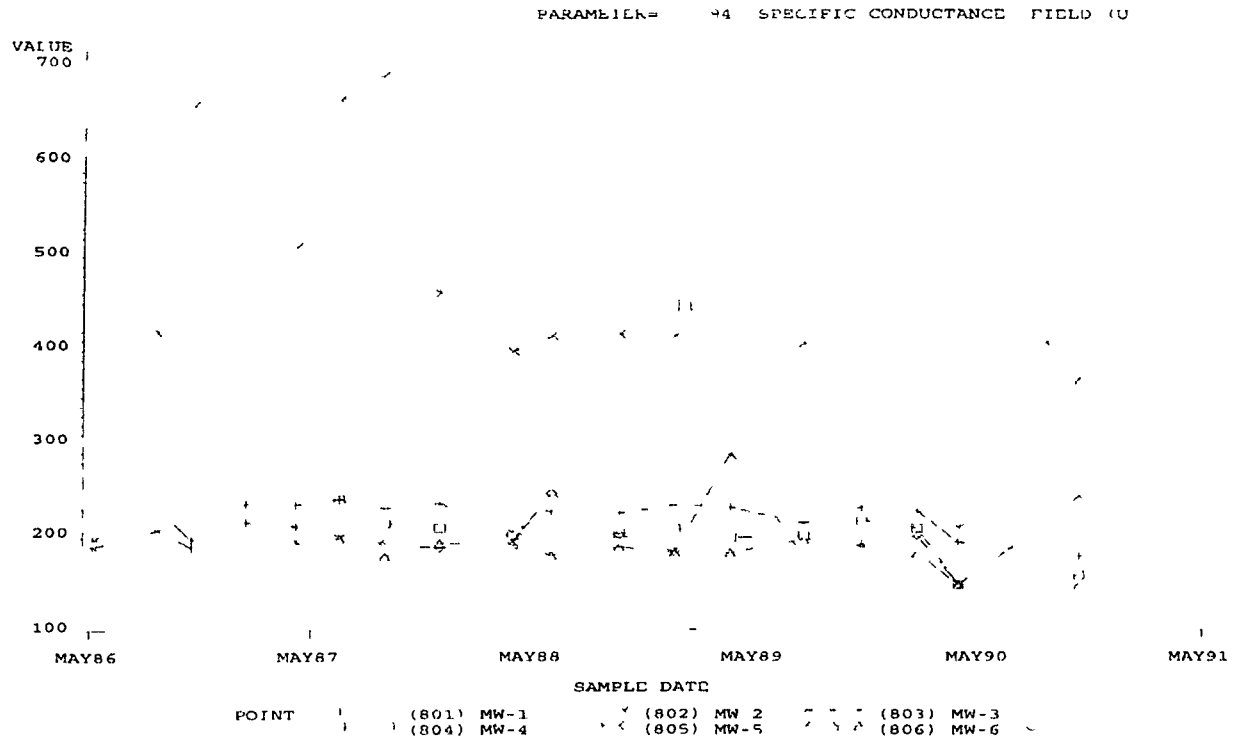


Attachment 8
Time vs. Concentration Plot

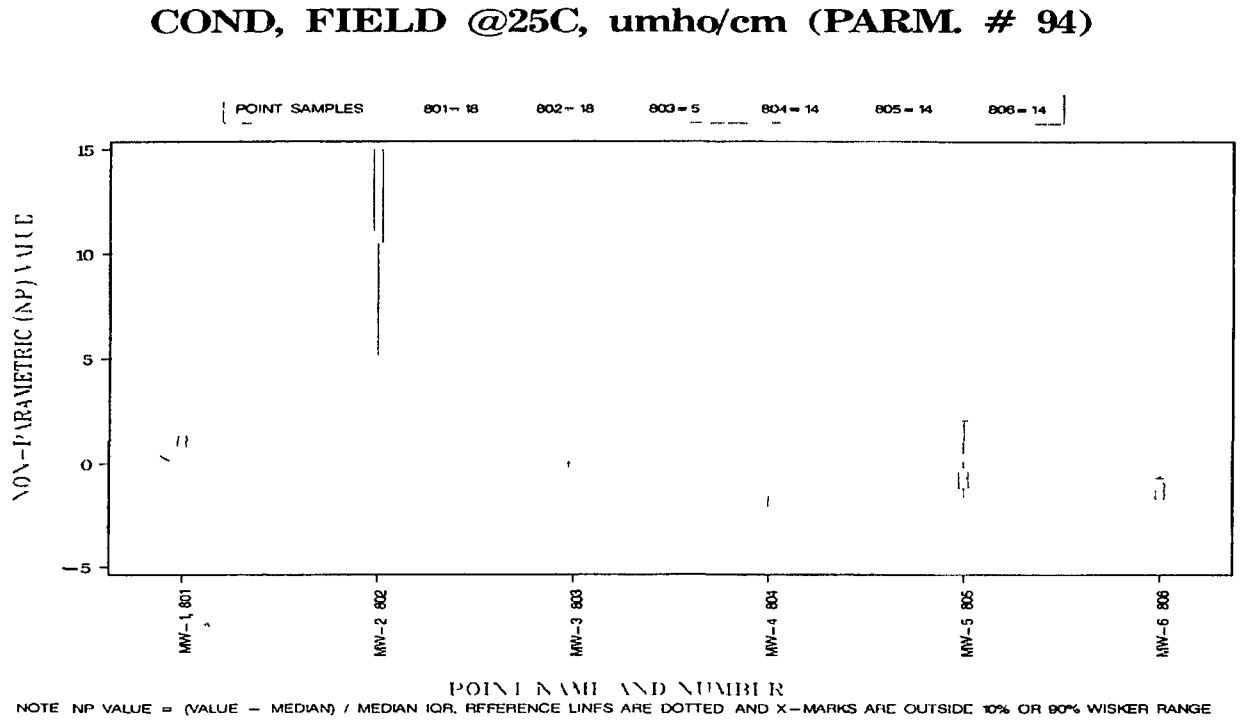


Attachment 9
Example of an Impacted Well

Time vs concentration plot showing an impacted well (MW-2)



Box plot showing the same impacted well as above (MW-2).



ATTACHMENT 3

1972 '76, 1980-'84 and 1988 1992

Lila Mayoral directed the government's Office of the First Lady during that time and created the non-profit group Give a Hand to Puerto Rico in the aftermath of the devastating hurricane in September 1989 After the storm, Mayoral organized a telephone fund-raising drive that drew $15 6 million.

Kevin MacMichael, 51
Musician, Cutting Crew member

Halifax, Nova Scotia — Kevin MacMichael, a guitarist and founding member of the 1980s rock band Cutting Crew, died Dec 31 of lung cancer

MacMichael, 51, formed Cutting Crew in England in 1985 with vocalist Nick Van Eede, and the group had a hit single in "(I Just) Died in Your Arms," along with a Grammy Award

...al trilogy "The Cypresses Believe in God," died at his home Friday He was 85

Known for his direct, realistic style, Gironella won Spain's prestigious Nadal Prize in 1946

Milw. Journal Sent. January 8, 2003

EPA

EPA To Review
Fadrowski Drum Disposal Superfund Site
Franklin, Wisconsin

Comments Invited

U S Environmental Protection Agency will soon begin a five-year" review of the Fadrowski Drum Disposal Superfund site located on South 27th Street in Franklin The federal Superfund law requires a review at least every five years at sites where the cleanup is complete, but low levels of hazardous waste remain on the site, EPA conducts the review to make sure the cleanup still protects people and the environment This is the second such review of the Fadrowski site since cleanup work was completed in 1995

The cleanup, begun in 1993, included

- digging up and hauling away over 160 buried drums and 135 tons of soil
- closing a 2½ million-gallon pond containing hazardous chemicals
- placing a landfill "cap" made of many layers of compacted clays and soils over the 2,400 tons of remaining waste to keep it from entering nearby soil, surface water, ground water and air,
- installing a collection system to prevent any landfill liquids (leachate) from going off site and
- testing ground water, sediment (river mud), surface water and leachate four times a year to make sure that over time, natural processes break down chemicals to levels that meet state and federal regulations

The first five-year review in 1998 found no contaminants in surface water or sediment Therefore EPA stopped monitoring in these areas Ground water was found to be contaminated in 1998 but since that time, chemical concentrations have decreased

During the upcoming review, EPA, with help from Wisconsin Department of Natural Resources, will study ground water and leachate samples collected over time and inspect the site EPA and WDNR will decide how often the ground water should be tested since natural processes have been breaking down the contaminants EPA will then prepare a report of its findings

EPA invites you to provide us with information that you think might be important in this site review Please provide your input or direct questions to

Bri Bill
Community Involvement Coordinator
U S EPA (P-19J)
77 W Jackson Blvd
Chicago, IL 60604
(800) 621-8431 x 36646
bill briana@epa gov

The Five-Year Review Report will be complete by October 2003 Site-related documents are available for review at the Franklin Public Library reference desk, 9151 W Loomis Rd , and Franklin City Hall (city clerk s office), 9229 W Loomis Rd

551993

ATTACHMENT 4

COMMUNITY INTERVIEWS

The FDDS inspection was conducted on September 10, 2003 by members of the five-year review team. Representatives included the EPA RPM Sheila Sullivan, WDNR project manager Binyoti Amungwafor, Ayres Associates' project manager Lori Rosemore, ESC Director of Operations Frank Perugini, and Scott Freimark. These representatives were also interviewed as part of the community interview process.

ESC staff perform the day to day O&M activities and monitoring activities for the Site: ESC representatives indicated that no problems have occurred regarding Site security, and no concerns have been raised by the local commercial and residential inhabitants.

The development of property around the FDDS has continued to occur since the 1998 five year review. In addition to the newly built Goodwill Store, the former Menard property directly north and adjacent to the Site is now occupied by the Ashley Home Furnishings store and warehouse, which opened on July 26, 2003. The RPM met with the Ashley Home Furnishings Store Manager, Steve Lewent, to discuss the FDDS. Mr. Lewent indicated that the store employed 70 people; however, none of them were aware or had any knowledge of the adjacent FDDS property. He has not heard any concerns expressed about the Site, nor has he witnessed any trespassing at the Site. The RPM also visited the current occupant (Halloween Express) of the former CGO Carpet store located on a narrow parcel between the east boundary of the Site and S. 27th Street. The facility is being rented out to short-term vendors. The store staff indicated that they were not aware of the Site or any related concerns, nor had they witnessed and trespassing.

I visited the Franklin Public Library to review the FDDS Administrative Record (AR). A conversation with library Director, Barbara Roark, indicated that few citizen requests (3-4) to view the AR have occurred over the past year. For document control purposes, the AR is not kept out on the library floor; however, Ms. Roark was concerned about the completeness of the AR. I committed to sending her a comprehensive list of the AR documents to help her determine whether any documents were missing, and request copies from EPA. I indicated that I would send the listing prior to the upcoming publication of the deletion notice, so that citizens reviewing the AR would have a complete set available.

Lastly, I visited the City Clerk's Office of the Franklin City Hall to view the other AR. City Clerk Sandi Wesolowski indicated that only one person has asked to see the AR in the past two years. Ms. Wesolowski was not sure if City Hall had the same documents as the library. I offered to send her a comprehensive AR document listing also. The City Clerks staff also indicated that the Site has not been an issue at City Hall. This was likely due to the fact that there have been many recent changes in personnel within the City Planning and Development departments. With the exception of the City Engineer, they were not sure whether any of the new staff were even aware of the Site.

At City Hall, I met with Donald Dorson, Alderman and Chair of the Franklin Environmental Commission (FEC). We discussed the City of Franklin, the development in the vicinity of the Site, and whether any citizen concerns have been expressed regarding the Site. Mr. Dorson indicated that the City currently has a population of about 30,000 residents, which is expected to grow over the next decade. Any development occurring around the Site does prompt interest and questions from members of the FEC, as the members do keep up with the Site. Further, citizens do attend meetings of the FEC whenever a new development enters the area. Some of these developments include: commercial development of the parcel between the Gander Mountain Store, directly south of the Site , and Rawson Avenue; residential (condominium) development of the lot directly west of the aforementioned parcel and south of the Goodwill Store; residential developments are planned for both north and south of Puetz Road; and, a condominium development is planned for the parcel directly south of Drexel Road.

I indicated my concerns about whether citizens in the area were still using private wells. The Assistant City Engineer, Ronald Romeis, provided maps of the water supply infrastructure. The maps indicated that the Franklin municipal water supply is available and utilized by the large commercial establishments and residential developments in ; he vicinity of the Site. However, there are some private residences south of Rawson Avenue, such as along Minnesota Avenue, that still use private wells. The City anticipates that within five years, these residences will discontinue well water use because the land south of Drexel Road will be further developed and City water mains will be extended accordingly. Mr. Romeis also provided aerial printouts to facilitate our discussions.

We ended our discussion with my inquiry as to how the EPA could assist the City and the type of information we could supply them with, particularly in light of the upcoming deletion of the FDDS from the NPL. Mr. Dorson agreed that a fact sheet discussing the results of the five year review and the Site deletion process would be very useful to the FEC and the general citizen population. I also offered to make myself available, to attend or give a presentation at any upcoming FEC meetings if necessary. Mr. Dorson appreciated my meeting with him and future availability as needed.

ATTACHMENT 4 (cont.)

Contact List For City of Franklin, Wisconsin

Franklin City Officials

Frederick F. Klimetz, Mayor	Ext. 7529 or (414)427-7700
Don Dorsan, 1st District Alderman	(414)427-7601 or (414)427-8988
Tim Solomon, 2nd District Alderman	Ext. 6222 or (414)529-2355
Ralph Netzel, 3rd District Alderman	(414)427-7603 or (414)423-5829
Basil Ryan, 4th District Alderman	Ext. 6244 or (414)425-7500
Lyle Sohns, 5th District Alderman	(414)427-7605 or (414)421-1216
Jim Bergmann, 6th District Alderman	Ext. 6266 or (414)425-3773
Ronald J. Wambach, Municipal Judge	(414)541-6800

To reach the Mayor or an Alderman through their extension numbers, call (414)425-7500.

Franklin City Departments

Administration	(414)425-7500
Assessor	(414)425-1416
Building Inspection	(414)425-0084
City Clerk	(414)425-7500
City Hall	(414)425-7500
Engineering Department	(414)425-7510
Fire Department	(414)425-1420
Health Department	(414)425-9101
Human Resources	(414)427-7505
Library	(414)425-8214
Municipal Court	(414)425-4768
Parks	(414)425-7500
Planning Department	(414)425-4024
Police Department	(414)425-2522
Public Works Department	(414)425-2592
Sewer and Water Department	(414)421-2613
Recreation (School District)	(414)423-4646
Treasurer	(414)425-4770

FOR EMERGENCIES - CALL 9-1-1

Web Site: **http://www.ci.franklin.wi.us**

ATTACHMENT 5

LIST OF DOCUMENTS REVIEWED

Ayres Associates. October 1992. Pre-Final Remedial Design Report, Fadrowski Drum Disposal Site, Franklin, Wisconsin.

Ayres Associates. January 1993. Final Remedial Design Report, Fadrowski Drum Disposal Site, Franklin, Wisconsin.

Ayres Associates. March 1993. Final Design Report, Fadrowski Drum Disposal Site, Addendum: Pond Water Removal and Treatment.

Ayres Associates. March 1995. Remedial Action Construction Completion Report, Fadrowski Drum Disposal Site, Franklin, Wisconsin.

Ayres Associates. September 1995. Remedial Action Construction Completion Report Addendum, Ground Water Monitoring Well Installation Documentation Report, Fadrowski Drum Disposal Site, Franklin, Wisconsin.

Ayres Associates. September 1995 (revised November 1995). Operation and Maintenance Plan, Fadrowski Drum Disposal Site, Franklin, Wisconsin.

Ayres Associates. January 2, 2002. Background Ground Water Quality Evaluation, Fadrowski Drum Disposal Site, Franklin, Wisconsin.

Ayres Associates. November 2000. Ground Water Monitoring Program Two- Year Statistical Evaluation Report, Fadrowski Drum Disposal Site, Franklin, Wisconsin.

Ayres Associates. June, 2003. Draft Ground Water Monitoring Program Five-Year Statistical Evaluation Report, Fadrowski Drum Disposal Site, Franklin, Wisconsin.

Syftestad, Eric P. 1985. Public Water Supply Data Book. Wisconsin Department of Natural Resources. USGS. WATSTORE Database.

United States Environmental Protection Agency (USEPA). June 10, 1991. Record of Decision for the Fadrowski Drum Disposal Site, Franklin, Wisconsin.

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Wisconsin Department of Natural Resources Files. Emerald Park Landfill, Metro Disposal Facility, and Future Parkland Landfill.

Wisconsin Department of Natural Resources Ground Water Retrieval Network.

Wisconsin Department of Natural Resources Municipal Water Supply Database. City of Franklin Water Supply Wells Analytical Results.

Wisconsin Department of Natural Resources BRRTS Website.

ATTACHMENT 6

Five-Year Review Site Inspection Checklist (Template)

I. SITE INFORMATION

Site name: Fadrowski Drum Disposal	**Date of inspection:** 9/10/03
Location and Region: Franklin, WI	**EPA ID:** WID980901227
Agency, office, or company leading the five-year review: U.S. EPA	**Weather/temperature:** Sunny, warm, dry, 76° F

Remedy Includes: (Check all that apply)

- ☒ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other _____
- ☒ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☒ Site map attached See Report

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Lori Rosemore, Ayres Assoc. (Name) Project Mgr. (Title) 9/10/03 (Date)
   Interviewed ☒ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☒ Report attached See Attached report and community Interview Summary

2. **O&M staff** Frank Perugini, ESC corp. (Name) Operations Director (Title) 9/10/03 (Date)
   Interviewed ☒ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☒ Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency	Contact Name	Title	Date	Phone no.
WDNR, SE	Binyati Amungwafor	Project Mgr.	9/10/03	

Problems; suggestions; ☒ Report attached

Agency	Contact Name	Title	Date	Phone no.
City of Franklin	Ronald Romeis	Asst. City Eng.	9/10/03	

Problems; suggestions; ☒ Report attached

Agency	Contact Name	Title	Date	Phone no.
City of Franklin	Donald Dorson	Alderman	9/10/03	

Problems; suggestions; ☒ Report attached

Agency	Contact Name	Title	Date	Phone no.

Problems; suggestions; ☐ Report attached

4. **Other interviews** (optional) ☒ Report attached.

Ashley Home Furnishings Store Manager
Franklin Public Library Director

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☒ O&M manual	☒ Readily available	☒ Up to date	☐ N/A
☒ As-built drawings	☒ Readily available	☒ Up to date	☐ N/A
☒ Maintenance logs	☒ Readily available	☒ Up to date	☐ N/A

Remarks Monthly Logs are kept at ESC office, Muskego, WI
Semi Annual/Annual Kept at Ayres office, Eau Claire, WI
WDNR office, Milw., WI

2 **O&M Cost Records**

☒ Readily available ☐ Up to date

☐ Funding mechanism/agreement in place

Original O&M cost estimate 0.3M ☒ Breakdown attached

Total annual cost by year for review period if available

From 1996 (Date)	To 1998 (Date)	120,000 (Total cost)	☒ Breakdown attached
From 1998 (Date)	To 2003 (Date)	100,483 (Total cost)	☒ Breakdown attached
From ____ (Date)	To ____ (Date)	____ (Total cost)	☐ Breakdown attached
From ____ (Date)	To ____ (Date)	____ (Total cost)	☐ Breakdown attached
From ____ (Date)	To ____ (Date)	____ (Total cost)	☐ Breakdown attached

3 **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons N/A

V. ACCESS AND INSTITUTIONAL CONTROLS ☐ Applicable ☐ N/A

A. Fencing

1 **Fencing damaged** ☒ Location shown on site map ☒ Gates secured ☐ N/A

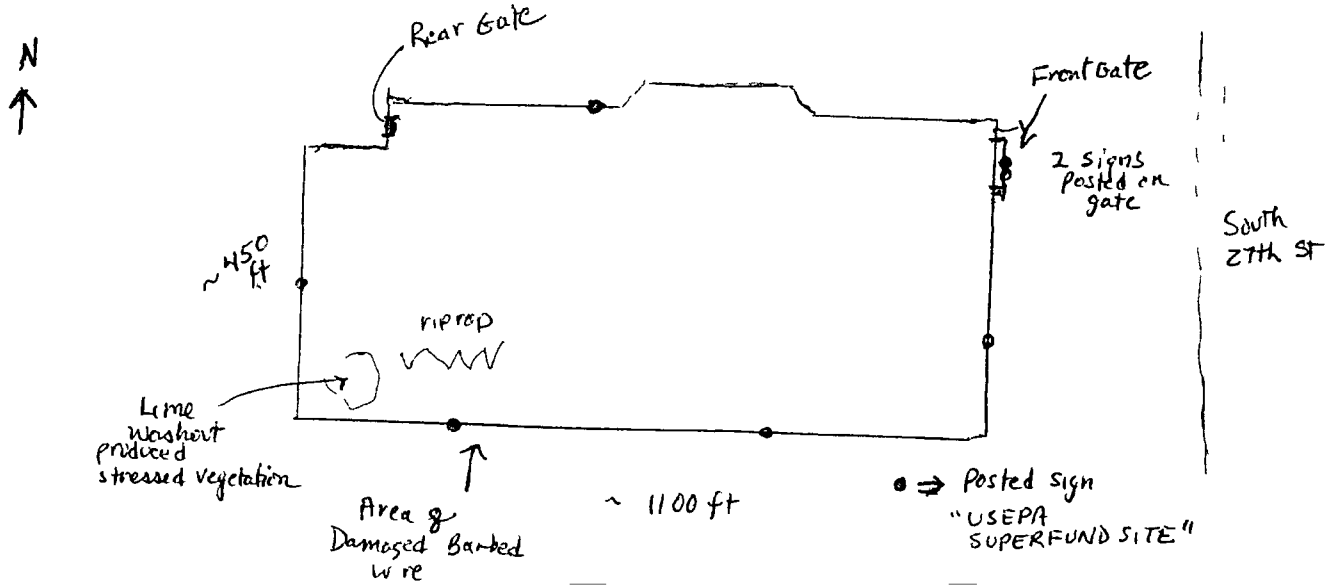
Remarks See map below)

B. Other Access Restrictions

1 **Signs and other security measures** ☒ Location shown on site map ☐ N/A

Remarks Signs not visible enough and ~~too~~ are posted at >200 foot intervals

C. Institutional Controls (ICs)



2.	**Site-Specific Health and Safety Plan**	☒ Readily available	☒ Up to date	☐ N/A
	☐ Contingency plan/emergency response plan	☒ Readily available	☒ Up to date	☐ N/A
	Remarks			
3.	**O&M and OSHA Training Records**	☒ Readily available	☒ Up to date	☐ N/A
	Remarks			
4.	**Permits and Service Agreements**			
	☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
	☐ Effluent discharge	☐ Readily available	☐ Up to date	☐ N/A
	☒ Waste disposal, POTW	☒ Readily available	☒ Up to date	☐ N/A
	☐ Other permits	☐ Readily available	☐ Up to date	☐ N/A
	Remarks Discharge of leachate to MMSD sewer system			
5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks			
6.	**Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks			
7.	**Groundwater Monitoring Records**	☒ Readily available	☒ Up to date	☐ N/A
	Remarks			
8.	**Leachate Extraction Records**	☒ Readily available	☒ Up to date	☐ N/A
	Remarks			
9.	**Discharge Compliance Records**			
	☐ Air	☐ Readily available	☐ Up to date	☒ N/A
	☒ Water (effluent)	☒ Readily available	☒ Up to date	☐ N/A
	Remarks			
10.	**Daily Access/Security Logs**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks access and security information provided in monthly compliance/inspection reports			

IV. O&M COSTS

1.	**O&M Organization**	
	☐ State in-house	☐ Contractor for State
	☐ PRP in-house	☒ Contractor for PRP
	☐ Federal Facility in-house	☐ Contractor for Federal Facility
	☐ Other	

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e g* , self-reporting, drive by) _____

Frequency Monthly

Responsible party/agency Menard, Inc.

Contact	Name	Title	Date	Phone no.
	Paul Mahler	Corp. Counsel	9/10/03	715-876-2492
	Lori Rosemore, Ayres Assoc.	Project Mgr.	9/10/03	715-834-3161

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A

Reports are verified by the lead agency ☒ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A

Violations have been reported ☐ Yes ☐ No ☒ N/A

Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks City of Franklin indicated that no problems existed regarding the IC implementation and enforcement

D. General

1 **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks _____

2. **Land use changes on site** ☒ N/A

Remarks _____

3. **Land use changes off site** ☐ N/A

Remarks Area surrounding Site is developed commercially and residentially

VI. GENERAL SITE CONDITIONS

A. Roads ☐ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks _____

B. Other Site Conditions

Remarks _____

VII. LANDFILL COVERS ☐ Applicable ☐ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☒ Settlement not evident
   Areal extent _____ Depth _____
   Remarks _____

2. **Cracks** ☐ Location shown on site map ☒ Cracking not evident
   Lengths _____ Widths _____ Depths _____
   Remarks _____

3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident
   Areal extent _____ Depth _____
   Remarks _____

4. **Holes** ☐ Location shown on site map ☒ Holes not evident
   Areal extent _____ Depth _____
   Remarks _____

5. **Vegetative Cover** ☐ Grass ☒ Cover properly established ☒ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks Some Stress in SW corner due to washout from Goodwille retaining wall and below avg. rainfall

6. **Alternative Cover (armored rock, concrete, etc.)** ☒ N/A
   Remarks _____

7. **Bulges** ☐ Location shown on site map ☒ Bulges not evident
   Areal extent _____ Height _____
   Remarks _____

8. **Wet Areas/Water Damage** ☒ Wet areas/water damage not evident
   ☐ Wet areas ☐ Location shown on site map Areal extent _____
   ☐ Ponding ☐ Location shown on site map Areal extent _____
   ☐ Seeps ☐ Location shown on site map Areal extent _____
   ☐ Soft subgrade ☐ Location shown on site map Areal extent _____
   Remarks _____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☒ No evidence of slope instability
Areal extent_____
Remarks_____

B. Benches ☐ Applicable ☒ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☒ N/A or okay
Remarks_____

2. **Bench Breached** ☐ Location shown on site map ☒ N/A or okay
Remarks_____

3. **Bench Overtopped** ☐ Location shown on site map ☒ N/A or okay
Remarks_____

C. Letdown Channels ☒ Applicable ☐ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☒ No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** ☐ Location shown on site map ☒ No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** ☐ Location shown on site map ☒ No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** ☐ Location shown on site map ☒ No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ ☒ No obstructions
☐ Location shown on site map Areal extent_____
Size_____
Remarks_____

6 **Excessive Vegetative Growth** Type_____
☒ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations ☒ Applicable ☐ N/A

1 **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☒ N/A
Remarks_____

2 **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A
Remarks_____

3 **Monitoring Wells** (within surface area of landfill)
☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
☐ Evidence of leakage at penetration ☒ Needs Maintenance (1 well) ☐ N/A
Remarks overall condition of wells is good
1 well (8D) needs maintenance

4 **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A
Remarks_____

5 **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☒ N/A
Remarks_____

E. Gas Collection and Treatment ☐ Applicable ☒ N/A

1 **Gas Treatment Facilities**
☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
☐ Good condition ☐ Needs Maintenance
Remarks_____

2 **Gas Collection Wells, Manifolds and Piping**
☐ Good condition ☐ Needs Maintenance
Remarks_____

3 **Gas Monitoring Facilities** (*e g* , gas monitoring of adjacent homes or buildings)
☐ Good condition ☐ Needs Maintenance ☐ N/A
Remarks_____

F. Cover Drainage Layer ☐ Applicable ☒ N/A

1 **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
Remarks_____

2 **Outlet Rock Inspected** ☐ Functioning ☐ N/A
Remarks_____

G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A

1 **Siltation** Areal extent_____ Depth_____ ☐ N/A
☐ Siltation not evident
Remarks_____

2 **Erosion** Areal extent_____ Depth_____
☐ Erosion not evident
Remarks_____

3 **Outlet Works** ☐ Functioning ☐ N/A
Remarks_____

4 **Dam** ☐ Functioning ☐ N/A
Remarks_____

H. Retaining Walls ☐ Applicable ☒ N/A

1 **Deformations** ☐ Location shown on site map ☐ Deformation not evident
*Horizontal displacement*_____ Vertical displacement_____
Rotational displacement_____
Remarks_____

2 **Degradation** ☐ Location shown on site map ☐ Degradation not evident
Remarks_____

I. Perimeter Ditches/Off-Site Discharge ☒ Applicable ☐ N/A

1 **Siltation** ☐ Location shown on site map ☒ Siltation not evident
Areal extent_____ Depth_____
Remarks_____

2 **Vegetative Growth** ☐ Location shown on site map ☐ N/A
☒ Vegetation does not impede flow
Areal extent_____ Type_____
Remarks_____

3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Discharge Structure** ☐ Functioning ☒ N/A
Remarks N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
Areal extent_____ Depth_____
Remarks_____

2. **Performance Monitoring** Type of monitoring_____
☐ Performance not monitored
Frequency_____ ☐ Evidence of breaching
Head differential_____
Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A
Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks_____

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks_____

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. **Collection Structures, Pumps, and Electrical**
☐ Good condition ☐ Needs Maintenance
Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks_____

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks_____

C. Treatment System ☐ Applicable N/A

1. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☐ Air stripping ☐ Carbon adsorbers
☐ Filters_____
☐ Additive (*e g* , chelation agent, flocculent)_____
☐ Others_____
☐ Good condition ☐ Needs Maintenance
☐ Sampling ports properly marked and functional
☐ Sampling/maintenance log displayed and up to date
☐ Equipment properly identified
☐ Quantity of groundwater treated annually_____
☐ Quantity of surface water treated annually_____
Remarks No gw. treatment -- leachate collection system from landfill flows to tank + discharge structure

2. **Electrical Enclosures and Panels** (properly rated and functional)
☐ N/A ☒ Good condition ☐ Needs Maintenance
Remarks_____

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ☒ Good condition ☐ Proper secondary containment ☐ Needs Maintenance
Remarks_____

4. **Discharge Structure and Appurtenances**
☐ N/A ☒ Good condition ☐ Needs Maintenance
Remarks_____

5. **Treatment Building(s)**
☒ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair
☐ Chemicals and equipment properly stored
Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
☒ All required wells located ☒ Needs Maintenance ☐ N/A
Remarks (well 8D only)

D. Monitoring Data

1. Monitoring Data
☒ Is routinely submitted on time ☒ Is of acceptable quality

2. Monitoring data suggests:
☐ Groundwater plume is effectively contained ☒ Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
☒ All required wells located ☒ Needs Maintenance ☐ N/A
Remarks (well 8D

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

Remedy includes landfill cap and leachate collection system. Leachate is monitored and discharged to NMSD. Nested groundwater monitoring wells at corners of landfill to track effectiveness of natural attenuation. Site access controls and deed restrictions are in place.

Overall, remedy is functioning very well and appears to be accomplishing the RAO's for the site.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

The remedy is functioning well and has met the RAOs set forth in the 1991 ROD. The RP, Menard, through its contractors, is performing O+M activities in an effective manner. The site is protective in the current and long-term

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

No indicators of potential problems were seen. The Only issues of concern, which are easily remedied, involve posting of warning signs at more frequent intervals, fixing barbed wire on one segment of fencing, fixing M.W. & D., and revegetating the small washout area near the Goodwill fence line

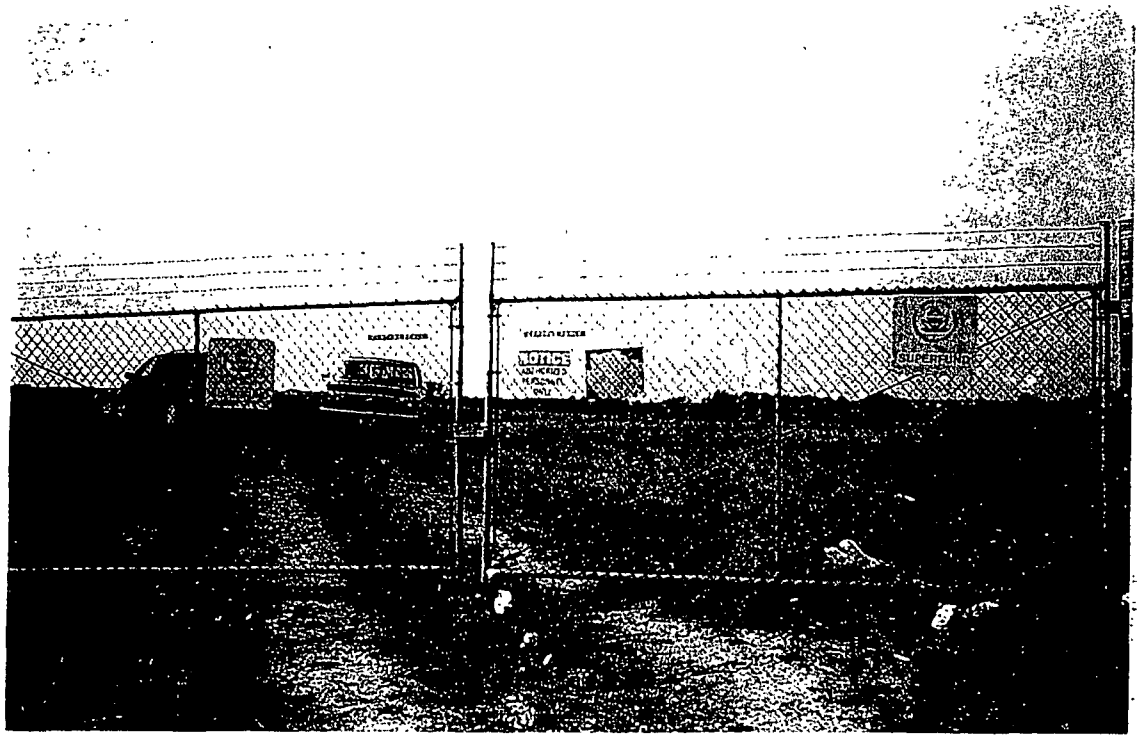
D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

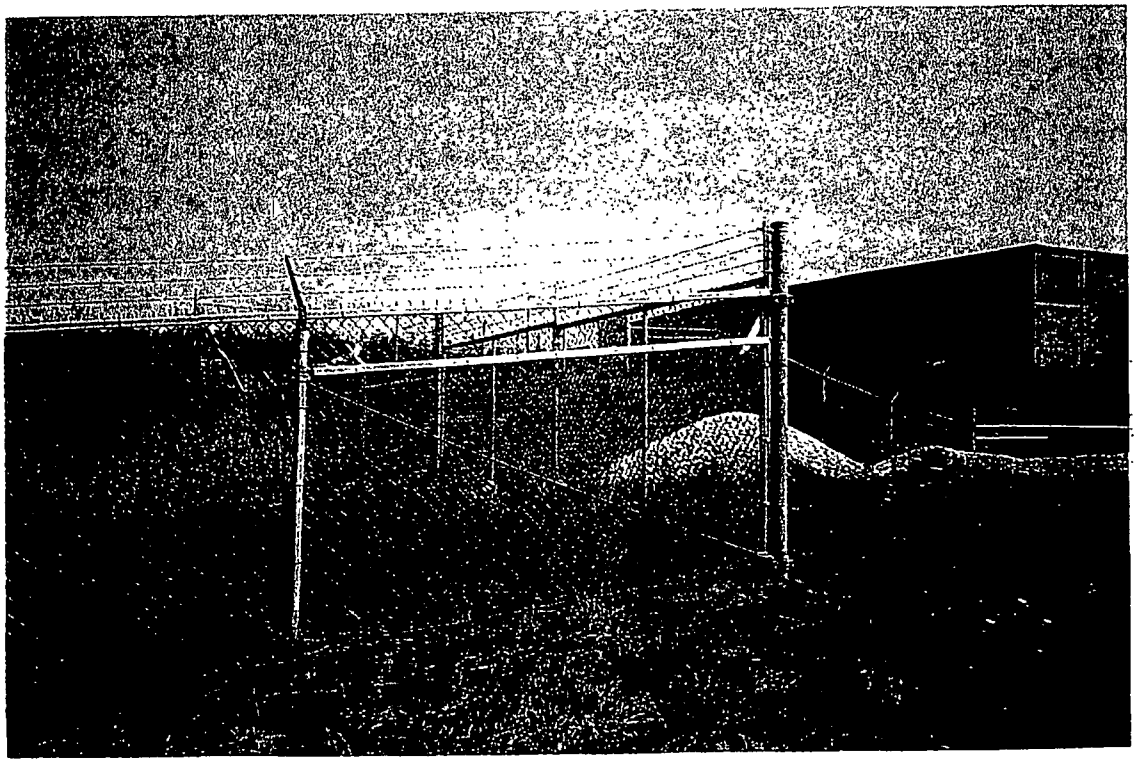
None at this time. Monitoring frequency and parameters have already been reduced. May be able to reduce monitoring frequency from semiannually to annually in the future.

ATTACHMENT 7

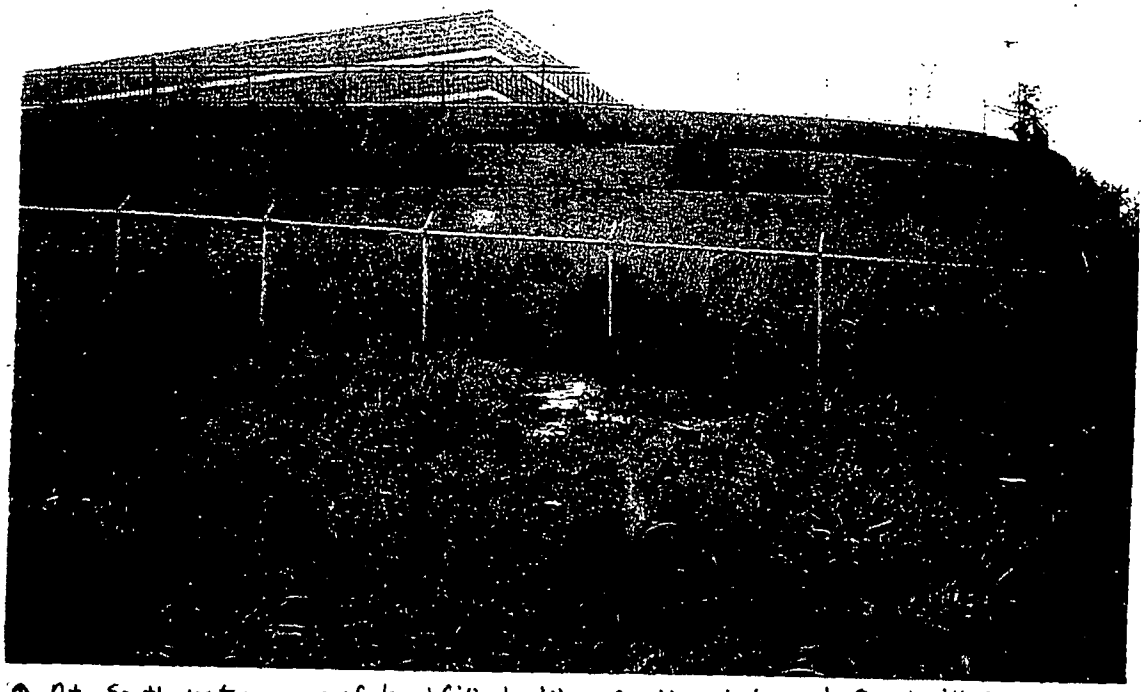
PHOTOGRAPH LOG
FIVE-YEAR REVIEW INSPECTION
SEPTEMBER 10, 2003
William E. Muno, Director Superfund Division



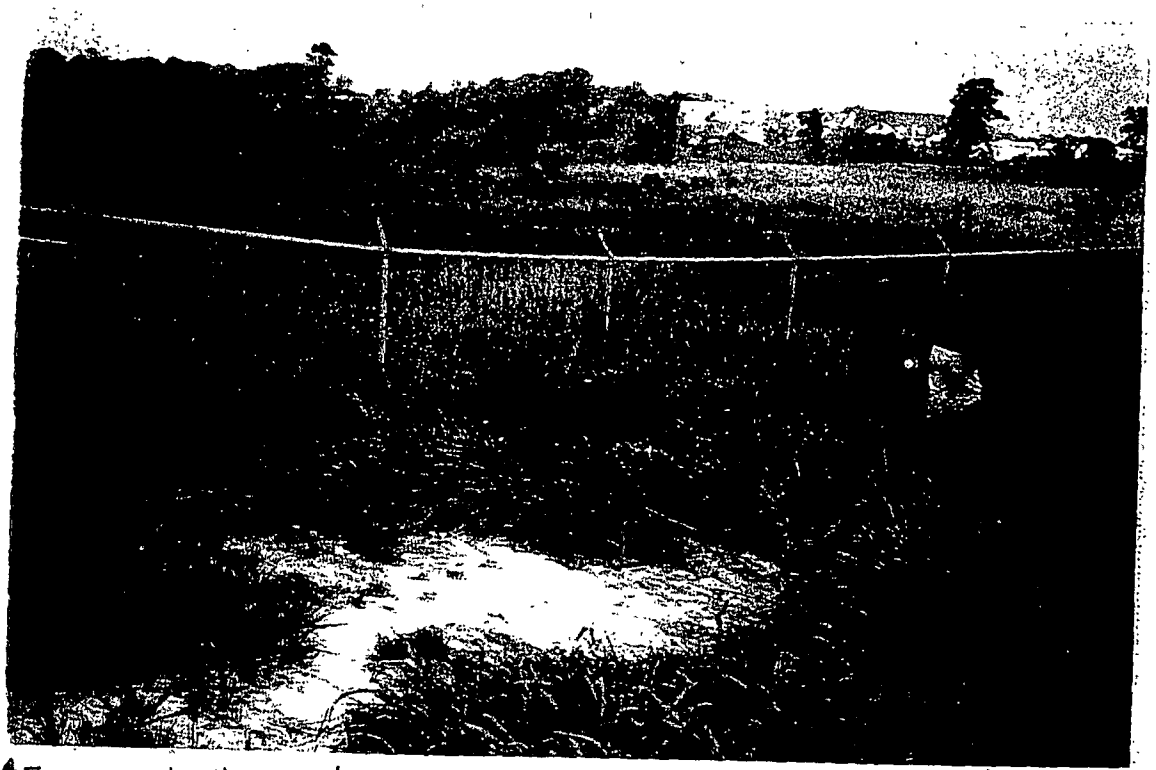
Front entrance gate to the FDDS property.



Rear property gate at northwest portion of perimeter fence.

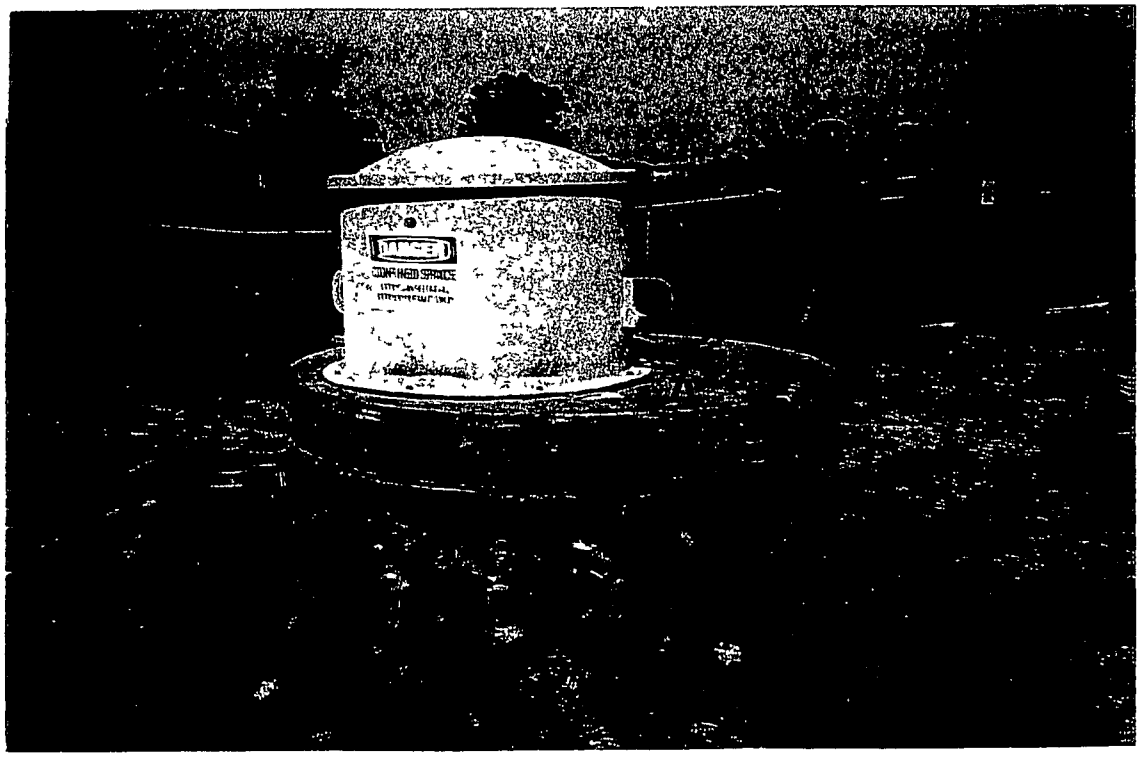


↑ At Southwest corner of landfill looking southwest toward Goodwill Store retaining wall. The limewashout area is just north of fence Monitoring well nest 7 is in the midground right.



↑ Foreground shows limewashout area and stressed vegetation at southwest corner. Housing development is directly west of unnamed tributary, indicated by treeline.

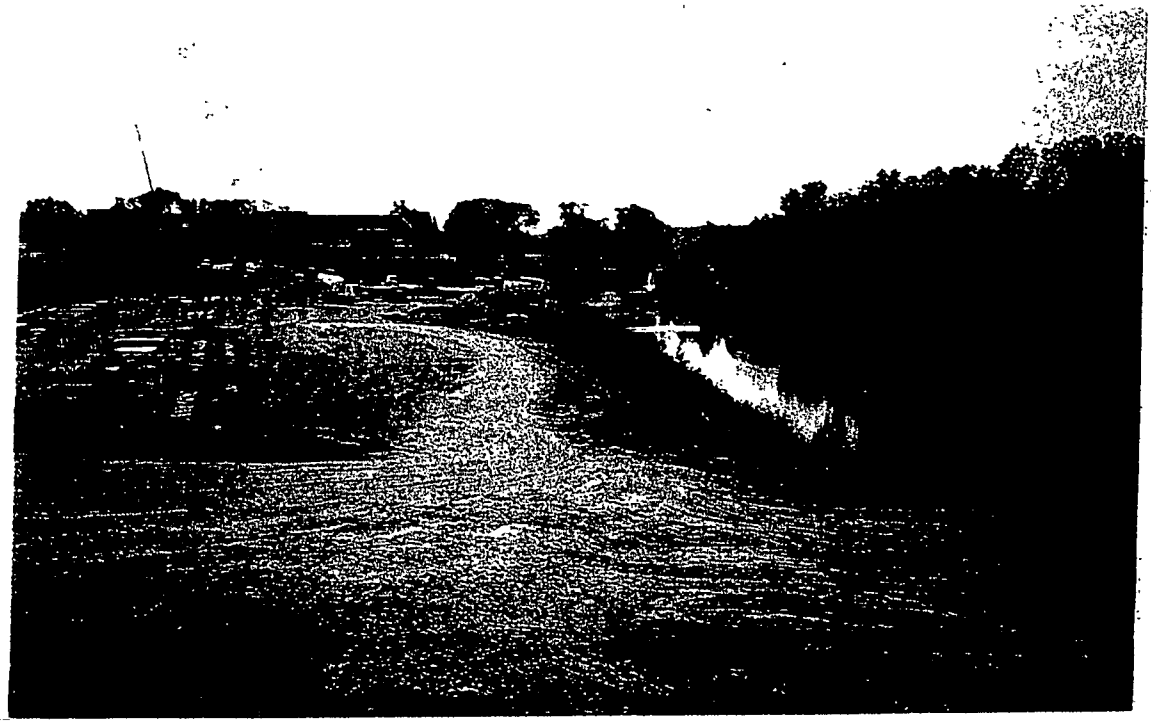
Monitoring Well nest in northwest corner of Site. MW 8D (left side) shows gap between casing and cap due to casing settlemen



Leachate collection system near northwest part of Sit

The lift station connec to a buried flow through tank, which drains to the sewer system

Unnamed Tributary Streambed. The tributary delineates western Site boundary.



Construction underway for Riverwoods Condo. Developme located directly West of Goodwill Store.

ATTACHMENT 8

REEL 3054 IMAGE 2643

RECEIVED

JUL 2 6 1993

DECLARATION OF RESTRICTION ON USE OF REAL PROPERTY

Menard, Inc., the record owner hereby declares and imposes the following restrictions on the real property (also known as the Fadrowski Drum Disposal Site - "FDDS") located in the County of Milwaukee, Franklin, Wisconsin, more particularly described as follows:

A parcel of land located in the southeast one-quarter of Section 1, T5N, R21E, City of Franklin, Milwaukee County, Wisconsin also being part of parcel 2 of Certified Survey Map No. 1316 on Reel Number 540, Image 283 - 285, Document No. 4536489 as recorded in Milwaukee County, Wisconsin. Said Parcel described as follows:

Beginning at the southeast corner of said Parcel 2, CSM #1316;
thence S 87° 31' 33" W, 320.00 feet;
thence S 00° 06' 34" W, 125.00 feet;
thence S 87° 31' 33" W, 1056.00 feet;
thence N 00° 16' 31" E, 545.42 feet;
thence N 88° 47' 26" E, 1373.39 feet;
thence S 00° 06' 34" W, 390.00 feet to the point of beginning;

6778270
RECORD 16.00

RECITALS

WHEREAS, the United States Environmental Protection Agency (U.S. EPA) has issued a Record of Decision adopting a remedial action plan which requires Remedial Action to be undertaken on the property and institutional controls to assure that the remedy is protective of human health and the environment;

WHEREAS, the United District Court for the Eastern District of Wisconsin has approved a Consent Decree entered into between the United States of America and certain Settling Defendants (in a case styled United States of America v. Acme Printing Ink. Co., et al.) which Consent Decree concerns the remedial actions to be undertaken at the FDDS property. Section V of the Consent Decree and Section II(b) of the Statement of Work ("SOW") attached to the Decree require institutional controls which are necessary to effectuate and protect the Remedial Action pursuant to the Consent Decree at the FDDS and to protect the public health or welfare or the environment at the FDDS site;

6778270
REGISTER'S OFFICE } ss
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REGISTER

NOW, THEREFORE, by this instrument there are created, declared and established at the property the following institutional controls and requirements that shall, unless amended, run with the land and remain in full force and effect in perpetuity from the date hereof, irrespective of any sale, conveyance, alienation, or other transfer of any interest or estate in such property.

RESTRICTIONS APPLICABLE TO THE PROPERTY

The following institutional controls and restrictions shall apply to the property described above:

1. There shall be no consumptive or other use of the groundwater underlying the property.

2. There shall be no use of, or activity at, the property that may interfere with the Work performed or to be performed under the Consent Decree at the property, or any activity which may damage any Remedial Action component contracted for or installed pursuant to the Consent Decree or otherwise impair the effectiveness of any Work to be performed pursuant to the Consent Decree.

3. There shall be no installation, construction, removal or use of any buildings, wells, pipes, roads, ditches or any other structures at the portion of the property covered by the landfill cap except as approved by the U.S. EPA as consistent with the Consent Decree and SOW.

4. There shall be no residential use of the property.

The restrictions specified above shall continue in full force and effect in perpetuity, or until such time as the U.S. EPA issues a determination in writing or the court rules either to modify or terminate any of the restrictions in response to a petition from the owner(s) of the property, as provided below.

COPY OF RESTRICTIONS

A copy of these restrictions shall be provided by the owner(s) of the property to all successors, assigns and transferees of th property.

PETITION TO MODIFY OR TERMINATE DEED RESTRICTIONS

After all Work, as defined in the Consent Decree and SOW, has been completed, the owner(s) of the property may petition the Regional Administrator of the U.S. EPA, Region V, or his delegate, to modify or terminate any of the deed restrictions. Any petition for modification or termination shall state the specific provision sought to be modified or terminated and any proposed additional uses of the property. No proposed modifications or terminations may be inconsistent with the Consent Decree and SOW.

The property owner(s) shall provide to the Settling Defendants a copy of any petition for modification or termination of deed restrictions submitted to the U.S. EPA. Any Settling Defendant may object to the proposed use of the property on the grounds that such use is not consistent with the Consent Decree or the SOW, or may result in exceedances of groundwater Cleanup Standards set forth in the Consent Decree and SOW. Any Settling Defendant so objecting shall notify the owner(s) of the property, the U.S. EPA, and the State of Wisconsin in writing, within thirty (30) days of receipt of the petition. The Regional Administrator or his delegate may allow or deny the petition for modification or termination in whole or in part. Any dispute as to the Regional Administrator's or his delegate's determination is subject to Section XX (Dispute Resolution) of the Consent Decree.

SEVERABILITY

If any provision of this Declaration of Restriction On Use of Real Property is held to be invalid by any court of competent jurisdiction, the invalidity of such provision shall not effect the validity of any other provisions hereof. All such other provisions shall continue unimpaired in full force and effect.

CONFLICT OF LAWS

If any provision of this Declaration of Restriction On Use of Real Property is the subject of any law or regulation established by any federal, state or local government, the more restrictive of the two standards shall prevail.

No provision of this Declaration of Restriction On Use of Real Property shall be construed so as to violate any applicable zoning laws, regulations or ordinances. If any such conflict does arise, the applicable zoning laws, regulations or ordinances shall prevail, unless they are inconsistent with CERCLA.

The undersigned person executing this Declaration of Restrictions On Use of Real Property on behalf of the owner(s) of the property represents and certifies that he is duly authorized and has been fully empowered to execute this Declaration.

IN WITNESS WHEREOF, the owner of this property has caused this Declaration of Restrictions On Use of Real Property to be executed on this 2nd day of June, 1992.

WITNESS:

Robert W. Corey

Paul H. Mahler

MENARD, INC.

by: Marv Prochaska
Marv Prochaska
Vice-President

STATE OF WISCONSIN)
)ss.
COUNTY OF EAU CLAIRE)

On this 2nd day of June, 1993, before me a Notary Public within and for this County and State, personally appeared Marv Prochaska to me personally known, who, being by me duly sworn did say that he is the Vice President of Menard, Inc., the corporation named in the foregoing instrument, and that this instrument was signed and sealed in behalf of the corporation by authority of its Board of Directors and Marv Prochaska acknowledged this instrument to be the free act and deed of Menard, Inc.

Notary Public, Eau Claire County
My Commission is permanent.

THIS INSTRUMENT DRAFTED BY: AND AFTER RECORDING IS TO BE RETURNED TO:
Robert W. Corey, Attorney
5136 Old Mill Center
Eau Claire, WI 54703

ATTACHMENT 9

SOLID WASTE TECHNICAL GUIDANCE
REDUCING OR TERMINATING GROUNDWATER MONITORING AT SOLID WASTE LANDFILLS

Summary: The Department has developed this guidance for landfill owners and operators considering reducing or terminating monitoring at solid waste landfills. It describes how requests should be prepared and criteria the Department will use in reviewing those requests. This guidance replaces previously released guidance for reducing monitoring frequency near landfills, published in the October 1997 "Solid Waste Technical Guidance", Vol. No. 97-2.

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Wisconsin Department of Natural Resources
Waste Management Program
P. O. Box 7921
Madison, WI 53707-7921

Contents:

Introduction

To reduce the risk of groundwater contamination and to protect present and future groundwater use, the Department of Natural Resources requires periodic groundwater monitoring near many landfills. Prior to 1996, routine monitoring normally occurred every 3 months (quarterly). Since 1996, the normal sampling frequency for newer landfills, with current design features, has been every 6 months (semiannually). Although administrative codes have changed, a landfill owner or operator must continue to monitor each landfill according to its approved plan until the Department formally approves any changes in the monitoring frequency.

This guidance covers three types of modifications to a facility's monitoring schedule:

- Reductions in frequency from quarterly to semi-annually.
- Reductions in frequency to less than semi-annually.
- Termination of monitoring.

In general, reductions of monitoring frequency from quarterly to semi-annual are possible at any type of landfill unless conditions, such as a release of contaminants from the facility, would require more frequent monitoring. Reductions in frequency to less than semi-annual are less likely to be approved, and may not be permitted for some types of facilities (see "Applicability" below). Finally, termination of monitoring may be possible only under rare circumstances where the volume and type of waste, hydrogeologic conditions,

and long term groundwater monitoring have shown that the facility does not, and will not, pose a threat to human health or the environment.

This guidance only addresses how to propose changes in monitoring frequency. It does not address changes in sampling parameters, sampling procedures, adding or replacing wells, etc. You may propose such changes at the same time you propose to reduce monitoring frequency.

Applicability to General Categories of landfills

Different types of landfills may have differing monitoring requirements, depending on which provisions of the Wisconsin Statutes or Administrative Code apply. A landfill will fall into one of the following general categories:

- Subtitle D Landfills. These are landfills that accepted municipal solid waste on or after October 9, 1993. (However, if a landfill received less than 100 tons per day on an annual basis, it is not a Subtitle D Landfill unless it accepted municipal solid waste on or after April 9, 1994.) Subtitle D landfills are subject to Wisconsin rules consistent with federal RCRA solid waste landfill regulations (see 40 CFR, parts 257 and 258). The minimum groundwater monitoring frequency for active or closed Subtitle D landfills is semi-annual (NR 507, Appendix I, Table 1, Wis. Adm. Code).

- Small or Intermediate Size Construction and Demolition Waste (C & D) Landfills. Small size C & D landfills are landfills for disposal of no more than 50,000 cubic yards of construction and demolition waste. Intermediate size C & D landfills are designed for disposal of more than 50,000 cubic yards but no more than 250,000 cubic yards of construction of demolition waste. These are regulated under ss. NR 503.09 and NR 503.10, Wis. Adm. Code, respectively. The minimum monitoring frequency for each is semi-annual. It is important to note that, because they are regulated under ch. NR 503, the Department does not have authority under the rule to reduce monitoring frequency to less than semi-annual for either a small or intermediate size C & D landfill.

- "Other Non-Subtitle D Landfills"(see NR 507.15(1) and NR 507.19, Wis. Adm. Code):
  - Construction and demolition waste landfills greater than 250,000 cubic yards.
  - Industrial waste landfills.
  - Municipal waste landfills that ceased accepting municipal solid waste prior to October 9, 1993, including both approved and non-approved landfills.
  - Municipal waste landfills which received less than 100 tons per day on an annual basis and which ceased accepting solid waste prior to April 9, 1994.

This guidance has been written regarding routine groundwater monitoring of solid waste landfills. Although the principles in this guidance may apply to landfills undergoing remediation, the Department will review the monitoring programs at remediation sites on a case-by-case basis.

Technical Recommendations about Monitoring Frequency

Based on current regulations, it is not possible to reduce monitoring to less than semi-annual or to terminate monitoring at Subtitle D landfills or the small and intermediate size construction and demolition waste landfills. Therefore, this part of the guidance is directed at the types of landfills listed in the previous section under "Other non-subtitle D Landfills". (The principles discussed below would also apply to the first two general categories of landfills if the proposal is to drop frequency from quarterly to semi-annual.)

The minimum monitoring frequency in ch. NR 507, Wis. Adm. Code, is semi-annual. However, under s. NR 507.19(2), Wis. Adm. Code, the Department may approve other sampling frequencies in writing. Although it is legally possible to reduce monitoring, the Department's technical staff recommend the following: (For a tabular presentation of the following monitoring frequencies, see Appendix A.)

1. The Department recommends that most landfills monitor groundwater semi-annually, as is required in administrative codes for today's state-of-the-art landfills. The Department may require more frequent monitoring depending on waste type(s), size, design, the physical environment or existing groundwater contamination (see NR 507.19(2), Wis. Adm. Code).. Quarterly and semi-annual frequencies give the best picture of trends in groundwater quality over time. The Department recommends that industrial landfills monitor groundwater at least semi-annually due to the waste volumes, waste types and potential for groundwater contamination.

2. Assuming the general criteria for reducing monitoring (next section) are met, the Department may determine that it is appropriate to reduce groundwater monitoring frequencies from semi-annual to annual. Monitoring frequencies less than annual are generally not sufficient to protect public health and the environment. Increasing trends in contaminants in groundwater may take too long to detect, especially if one or more samples were skipped or determined to be unreliable. Monitoring well maintenance and sample quality can decline if the well is sampled less than annually. In addition, for small municipal landfills on an annual budget cycle, monitoring less than once a year might be left off the budget during the "off" year and be forgotten thereafter.

3. The Department believes termination of monitoring is inappropriate for landfills. The only and very rare exceptions would be near landfills where future groundwater contamination is extremely unlikely. An example of such circumstances would be where all of the following are true:

   - The landfill accepted only municipal solid waste,
   - The landfill volume is very small,
   - The geologic and hydrogeologic conditions near the landfill would be suitable to prevent contamination migration (for example, groundwater is far removed from waste, soils are finer-grained and would inhibit contaminant movement, etc.),
   - Groundwater sampling results would demonstrate that any concentrations exceeding NR 140 groundwater standards or preventive action limits are due to background conditions, or that contaminant levels have decreased or stabilized at a low level and do not pose a threat to human health of the environment, and
   - The Department determines that NR 140 groundwater standards will not be exceeded beyond the Design Management Zone (defined in s. NR 140.22(3), Wis. Adm. Code) in the future.

The Department will evaluate proposals to terminate monitoring even more cautiously than proposals to reduce monitoring. Discontinuing monitoring and removing monitoring wells seriously complicates the future ability to determine whether a closed landfill is the source of groundwater contamination. Most closed landfills are located in areas where residents rely or may someday rely on private wells for water. A landfill that seems isolated now may be surrounded by homes and wells in the future. Furthermore, most landfills that closed before 1993 have design inadequacies that increase the potential for groundwater contamination -- such as, no liner, no leachate collection, groundwater near the waste, and highly permeable soils. Finally, the wording "alternative frequencies" in s. NR 507.19(2), Wis. Adm. Code, implies that some monitoring is required. Therefore, requests to terminate monitoring should be very rare and approved only based on the facts of each case.

General Criteria for Reducing or Terminating Monitoring

Landfill owners or operators requesting reduction or termination of groundwater monitoring should demonstrate all of the following.

- That a reduction or termination of monitoring does not present a threat to public health and welfare or the environment. The Department will review the landfill history, hydrogeology and monitoring data.
- That the facility has an adequate monitoring network. This means that a sufficient number of wells are in locations and at depths needed to detect groundwater contamination near the landfill and the wells were constructed properly and are in good condition. If this is not the case at your landfill, you should upgrade and repair the wells before submitting your request to reduce monitoring. If you are unsure, ask for a preliminary review (see "How to propose changes in monitoring frequency," below).
- That the data submitted to the Department are reliable and complete. This includes maps, well locations, well construction logs, groundwater monitoring data and other information. In particular, the Department will carefully evaluate data on volatile organic compounds (VOCs) to determine data reliability (see Appendix D "Quality Assurance Considerations for VOCs".) If data are unreliable, you will have to take more samples before the Department can review your request.
- That no significant groundwater contamination is evident. Any ONE of the following would be evidence of significant groundwater contamination:
  - Sample results which exceed preventive action limits (PALs) defined in NR 140 for Public Health Standards repeatedly. Note: repetitive Public Welfare Standard exceedances will be reviewed on a case-by-case basis.
  - Significant detection of VOCs in the groundwater after the landfill has been closed for a minimum of 5 years. This time limit may be increased if an analysis of the flow system shows that groundwater moves very slowly and therefore contaminants may not have reached the monitoring wells yet.
  - Significant differences in water quality when comparing upgradient or background wells with down gradient wells, where the difference cannot be reasonably attributed to other factors, such as soil/rock type, natural variability or other sources of groundwater contamination.

These are not legal requirements, but are set out because they will assist the Department in evaluating requests for reduction or termination of monitoring frequency and in most cases increase the probability they can be granted.

CAUTION:

A request to reduce monitoring may lead to increased monitoring!

The process of preparing and reviewing a request to reduce or terminate monitoring may disclose unanticipated conditions, such as groundwater contamination or an inadequate well network. These conditions may lead to increased monitoring requirements, an environmental investigation, or remediation of the landfill.

How to propose changes in monitoring frequency

The Department must approve changes in monitoring before you implement them. Here are some things you should know about proposing changes in monitoring frequency.

Preliminary Reviews The Department strongly recommends that you contact the Department hydrogeologist assigned to your facility for a preliminary review of your proposal before spending time and money compiling the information needed for a formal plan modification request. (Department staff assigned to your area are listed on the Department's Internet web site, at http://www.dnr.state.wi.us.) You may already have much of the necessary information in reports previously prepared for the site. However, for some closed sites, records are incomplete or outdated, and you should provide the information in Appendix B for the Department to review. The Department will provide a preliminary review and opinion. There is no fee for the preliminary review.

Plan Modifications If your plan of operation, groundwater monitoring plan or closure plan specifies a specific monitoring frequency, you must obtain written Department before you implement any change of monitoring. To initiate the approval process, you must submit a formal plan modification request to the Department for approval to amend this plan pursuant to s. 289.30(6), Stats.. All submittals must follow the general submittal requirements detailed in s. NR 500.05, Wis. Adm. Code, regarding the contents, format, number of copies, size of visuals, etc. For a detailed listing of the information to be submitted with your plan modification request, please refer to Appendix C.

Upon receiving your plan modification proposal, the Department will send an invoice to cover the cost of reviewing the plan, based on the plan review fees listed in s. NR 520, Wis. Adm. Code, Table 3. As of the date of this guidance, the plan review fee is $1500 for most landfills and $150 for landfills with only a closure plan approved under NR 514, Wis. Adm. Code. No fees are required for expedited plan modifications, which are discussed below. Fees are subject to change, so be sure to consult the most recent version of the chapter NR 520, Wis. Adm. Code.

Expedited Plan Modifications Wisconsin's solid waste rules outline a process by which certain plan modifications may be submitted to the Department. If the Department does not object within thirty days after it receives the expedited proposal, the proposed modifications are considered to be approved automatically (see s. NR 514.09, Wis. Adm. Code).

Except as noted below, the expedited plan modification process may apply to reductions of monitoring frequency from quarterly to semi-annual at a landfill where it is determined by the Department to pose low potential risk of adverse impacts on public health or the environment. The information to be submitted under the expedited plan modification process is the same as for a formal plan modification and is listed in Appendix C.

The expedited plan modification is not applicable to the following proposals:

- Proposals to change monitoring at small and intermediate size construction and demolition waste landfills, because these landfills are regulated under ch. NR 503, not ch. NR 514, Wis. Adm. Code.
- A change that would result in a violation of a statute or administrative rule, or an existing written condition contained in a department approval document, and would require issuance of an exemption by the Department.

In addition, the Department may object to proposals which do not pose a low potential risk to public health or the environment under s. NR 514.09(1)(a)13., Wis. Adm. Code, including:

- Proposals that would reduce monitoring frequency to less than semi-annually or would terminate monitoring. These are considered to be high-risk because of the potential for closed landfills to cause groundwater contamination and to affect nearby drinking water supplies.
- Complex proposals, that is, a single proposed plan modification which includes multiple requests. For example, you may propose to change the monitoring parameters, approve preventive action limits, grant exemptions to groundwater standards or change other aspects of sampling and landfill operation at the same time you request a reduction in monitoring frequency. These more complicated proposals take longer to review and should be submitted as formal plan modifications rather than expedited plan modifications.

Based on s. NR 214.09(1)(a)13., Wis. Adm. Code, it is likely that the Department would object to the above proposals for expedited plan reviews.

In any case, you should contact the DNR Hydrogeologist assigned to your facility prior to submitting a proposed expedited plan modification. There are no plan review fees for plans approved under the expedited plan review process. If the Department objects and you choose to submit a formal plan modification, you will be charged the appropriate plan review fee.

DISCLAIMER

This document is intended solely as guidance, and does not contain any mandatory requirements except where requirements found in statute or administrative rule are referenced. This guidance does not establish or affect legal rights or obligations and is not finally determinative of any of the issues addressed. This guidance does not create any rights enforceable by any party in litigation with the State of Wisconsin or the Department of Natural Resources. Any regulatory decisions made by the Department of Natural Resources in any matter addressed by this guidance will be made by applying the governing statutes and administrative rules to the relevant facts.

Appendix A
Groundwater Monitoring Frequencies for Various Landfill Categories

Landfill Type	Applicable Code Provisions	Legally Possible Monitoring Frequencies	Technically Recommended Monitoring Frequencies	Expedited Plan Review may be used to reduce to:
Subtitle D Municipal landfills	NR 507.15(2), and NR 507.19, Wis. Adm. Code	Semi-Annual. Federal Subtitle D regulations specify semi-annual.	Semi-annual or quarterly	Semi-annual
Small Size Construction & Demolition Waste landfills (Less than or equal to 50,000 c.y.)	NR 503.09(5), Wis. Adm. Code	Semi-annual. Other frequencies not allowed.	Semi-annual or quarterly	Not Allowed
Intermediate Size Construction & Demolition Waste landfills (More than 50,000 c.y. but less than or equal to 250,000 c.y.)	NR 503.10(7), Wis. Adm. Code	Semi-annual. Other frequencies not allowed.	Semi- annual or quarterly	Not Allowed
Large Size Construction & Demolition Waste landfills (More than 250,000 c.y.)	NR 507.15(1), and NR 507.19, Wis. Adm. Code	Semi-annual. DNR may approve other frequencies.	Semi-annual or quarterly	Semi-annual
Industrial landfills	NR 507.15(1), and NR 507.19, Wis. Adm. Code	Semi-annual. DNR may approve other frequencies.	Semi-annual or quarterly	Semi-annual
Non-Subtitle D Municipal landfills (see "Applicability" for description)	NR 507.15(1), and NR 507.19, Wis. Adm. Code	Semi-annual. DNR may approve other frequencies.	Semi-annual or quarterly	Semi-annual

**In rare cases, where the landfill meets the criteria in this guidance, annual monitoring may be appropriate. In extremely rare cases, monitoring may be terminated.

Appendix B
Information to Provide With a Request for a Preliminary Review

When you ask the Department for a preliminary opinion on the potential to reduce or terminate monitoring at your facility, you should submit the following information for Department review:[1]

1. A description of your proposed monitoring program and how it differs from your existing monitoring program. Presentation in a table is preferred.

   Note: The Department recommends monitoring of volatile organic compounds (VOCs) along with standard field measurements such as water elevation, conductivity (i.e., specific conductance), alkalinity and hardness temperature and pH. Monitoring of VOCs provides a direct measurement of representative toxic compounds that may be released by a landfill. Appendix D outlines quality assurance considerations for VOC samples.

   Note: The Department is reconsidering the usefulness of chemical oxygen demand (COD) [acronym is defined in s. NR 500.03(37)] as a monitoring parameter for certain landfills and waste types, because the test results may be highly variable and the analysis method itself generates a mercury waste. If COD does not appear to be a useful parameter at your landfill and if your current monitoring program includes sampling for VOCs, the Department may consider dropping COD from your list of required monitoring parameters and may add a substitute parameter such as Dissolved Organic Carbon (DOC). In some cases it may be acceptable to add VOCs and drop COD.

2. An evaluation of the monitoring network at the site, with specific attention given to:
   a. the positioning of the up-gradient and down-gradient wells,
   a. the condition of the wells, and
   a. identification of any repairs or improvements needed to ensure that the monitoring network is capable of accurately characterizing groundwater quality as it might be affected by the facility.

3. A current, adequately-scaled map that accurately depicts all of the following:
   a. The waste boundaries of the landfill;
   b. The location of all monitoring wells;
   c. The location of all private water supply wells within 1200 feet of the landfill;
   d. The location of all public water supply wells and high-capacity wells within one-half mile of the landfill;
   e. Relevant surface water features (such as wetlands within 300 feet and navigable waters within 1000 feet);
   f. The location of any structures on or near (within 300 feet of) the landfill; and
   g. The zoning of land within 1200 feet of the landfill and a key describing allowed uses under the current zoning ordinance.

4. Any information on monitoring of VOCs at the landfill, such as the last time such testing was performed, how often samples were analyzed and all results of VOC testing and quality assurance information. If VOCs have been monitored routinely, summarize the historical trends, list values exceeding groundwater standards, and discuss how the samples meet the quality assurance considerations in Appendix D.

5. Any other information that you believe is relevant to your request or that may update information in the Department's files. All data not already sent to the Department must be submitted on diskette in proper uploadable format.

The Department will base its opinion on the likelihood of reducing or terminating groundwater monitoring on the above information and previously-submitted monitoring results.

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[1] These are not legal requirements, but are set out because they will assist the Department in evaluating requests for reduction or termination of monitoring frequency and in most cases increase the probability they can be granted

Appendix C
Information to Provide With A Plan Modification Request to Reduce or Terminate Monitoring

Reduction of monitoring should not be requested if evidence of groundwater contamination is shown by should probably state "enforcement standards" and "preventive action limits" as defined in ch. NR 140 when using these terms, only "PAL" has been defined in the guidence text] ES exceedances, increasing PAL exceedances, or a history of volatile organic chemicals (VOCs) being detected.

If you choose to pursue a formal plan modification or expedited plan review to reduce the sampling frequency at your facility, you should prepare the plan according to the general submittal requirements in s. NR 500.05, Wis. Adm. Code and this Appendix.

Please submit all of the following information with your request to reduce monitoring to semi-annual.[2] If any of the information is in reports you have already submitted to the Department, you may refer to those reports. However, if any referenced report does not accurately reflect current conditions, you must describe the current conditions and update plan sheets, if necessary.

1. A description of the landfill, including:
   a. landfill size, that is, the number of acres filled
   b. depth of waste below ground surface
   c. volume of waste disposed (including daily cover)
   d. waste types
   e. years of operation
   f. history of operation and ownership
   g. whether or not waste was burned at the site
   h. landfill design, including any liner and leachate collection systems
   i. time since closure
   j. type and thickness of final cover
   k. depth to groundwater
   l. soil types
   m. distance to monitoring wells
   n. distance and direction to water supply wells
   o. distance to surface water and wetlands
   p. distance to buildings

2. An up-to-date, adequately-scaled map that depicts:
   a. the facility's property boundaries
   b. the zoning of the land within 1200 feet of the landfill
   c. all private water supply wells within 1200 feet of the landfill
   d. all public water supply and high-capacity wells within one-half mile.

3. Up-to-date, adequately-scaled groundwater table contour maps of the site, showing all of the following:
   a. the limits of waste filling
   b. the location of all monitoring wells
   c. the location of surface water features such as wetlands, streams and lakes
   d. the elevation of the static water table

[2] These are not legal requirements, but are set out because they will assist the Department in evaluating requests for reduction or termination of monitoring frequency and in most cases increase the probability they can be granted

e. groundwater contours (equipotential lines)
f. perpendicular streamlines indicating groundwater flow direction.

4. Separate plan sheets depicting:
   a. the high water table
   b. the low water table
   c. maximum variance in ground water flow direction. Indicate the maximum variation in flow direction based on the historical groundwater elevation data collected at the site. Indicate the flow direction at the high and low water table elevations based on the historical groundwater elevation data collected at the site.

5. An analysis of the 3-dimensional groundwater flow system at the site, including an estimate of groundwater velocity. Show your calculations.

6. Copies of well and boring logs for the monitoring wells on the site, indicating the geologic characteristics and the depth and screened interval of each well.

7. An analysis of all historic groundwater monitoring data to characterize groundwater quality and identify any trends.
   a. Describe the monitoring history, including the number of samples collected to date, how the samples were collected for various parameters, detection limits used, compliance with monitoring requirements, what quality assurance/quality control (QA/QC) samples were taken and an interpretation of QA/QC results. See also Appendices D and E.
   b. Assess landfill impacts by comparing background or upgradient groundwater conditions to downgradient conditions and by plotting concentrations vs. time for the wells. Please note that an increasing trend in concentration is not the only indicator of groundwater contamination. Most computer spreadsheet programs offer simple graphing and least-squares regression routines to determine whether a statistical trend exists in a data set.
   c. Answer these questions: Is the landfill contaminating groundwater? Yes, no or maybe? If maybe, what information is needed to determine if it is or isn't?

8. Results from 2 rounds of samples obtained within the past 2 years and analyzed for the VOCs and dissolved substances associated with landfill leachate listed in Appendix E. Samples should be taken to meet the quality assurance considerations listed in Appendix D. These samples should be obtained from each groundwater monitoring well at the landfill and each private, high capacity, and public water supply well within 1200 feet sidegradient or downgradient from the landfill. The wells should be sampled three to six months apart to account for seasonal variations. The data must be submitted on diskette in proper uploadable format.

9. A copy of an affidavit of site registry (Form #4400-67, available from the Department's Bureau of Waste Management at 608-266-2111) showing that the landfill's existence has been recorded in the county Registrar of Deeds' office. This is an official deed notice to inform future property owners of the existence of the solid waste landfill.

10. If you are proposing a reduction in monitoring frequency, a description of your proposed monitoring program and how it differs from your approved monitoring program. The proposed monitoring program should specify the frequency of sampling, wells and parameters to be sampled and the month(s) sampling will be conducted.

    Note: The Department strongly recommends monitoring of VOCs along with standard field measurements such as water elevation, specific conductance (conductivity), hardness, alkalinity,

temperature and pH. Monitoring of VOCs provides a direct measurement of representative toxic compounds that may have been released by a landfill.

Note: The Department is reconsidering the usefulness of COD as a monitoring parameter for certain landfills and waste types, because the test results may be highly variable and the analysis method itself generates a mercury waste. If COD does not appear to be a useful parameter at your landfill and if your current monitoring program includes sampling for VOCs, the Department may consider dropping COD from your list of required monitoring parameters and may add a substitute parameter such as Dissolved Organic Carbon (DOC). In some cases it may be acceptable to add VOCs and drop COD.

11. If you are proposing to monitor indicator parameters, you should calculate NR 140 preventive action limits (PALs) for all indicator parameters, except pH and temperature, for all wells using the latest guidance for calculating PALs and alternative concentration limits ACLs. (see also NR 140.20, Wis. Adm. Code). This guidance is available from the Department by calling 608-266-2111. If you are proposing to monitor only VOCs, you do not need to calculate PALs.

12. Certification that a professional geologist has prepared the report according to s. NR 500.05(4)(b), Wis. Adm. Code.

REQUESTS TO REDUCE TO ANNUAL MONITORING OR TO TERMINATE MONITORING

If you are submitting a plan modification to reduce monitoring frequency to annual or to terminate monitoring, you should submit all of the above items plus the additional information listed below.

13. Results from 4 rounds of samples obtained within the past 2 years and analyzed for the VOCs and dissolved substances associated with landfill leachate listed in Appendix E. Samples should be taken to meet the quality assurance considerations listed in Appendix D. These samples should be obtained from each groundwater monitoring well at the landfill and each private, high capacity, and public water supply well within 1200 feet sidegradient or downgradient from the landfill. The wells should be sampled three to six months apart to account for seasonal variations. Data must be on diskette in proper uploadable format. (You may include the 2 rounds required in item 8 above.)

14. Results of hydraulic conductivity testing to support your estimate of groundwater flow velocity and travel time to the nearest downgradient well.

15. A discussion of the potential for development of, and new water supply well installations on, land within 1200 feet of the landfill.

Appendix D:
Quality Assurance Considerations
for Volatile Organic Compounds (VOCs)

Your landfill's groundwater monitoring program may have been approved before the importance of VOC sampling was recognized. Therefore, there may be little or no VOC data for the Department to review along with your request to reduce or terminate monitoring. Depending on the type of reduction desired, you may need to gather more VOC samples before you submit your plan modification to the Department. Given the very limited amount of VOC data being requested and the importance of the decision being made, it is essential that the both the VOC sampling and the analyses be reliable. If samples are collected improperly or the quality of sampling results is poor, the data may be unusable. If so, the Department will require you to take more samples.

We strongly encourage you to incorporate data quality expectations into your contracts for services. This appendix will guide you in your selection of laboratories and consultants.

Sampling

The preferred sample collection method is low flow pumping; however, other methods may be acceptable. Using bailers for collecting samples is not an appropriate choice of sampling method because of the high probability that VOCs will be lost in the sampling process. The DNR *Groundwater Sampling Desk Reference* (PUBL-DG-037-96) [available at http://www.dnr.state.wi.us/org/water/dwg/gw/GW-SDR-A.PDF] describes various methods for collecting groundwater samples with their advantages and limitations. Flawed sampling techniques may mean that the sample results obtained are not representative. Additional sampling and analyses may be necessary to make a defensible decision.

Laboratories typically supply sample bottles, preservatives, and shipping instructions. For VOC samples to be valid, the bottle must be filled completely with no air space remaining. The samples must be cooled immediately. We strongly encourage using cubed ice to cool the samples rather than "blue ice" or other ice packs, which do not cool samples below 4 degrees Celsius (40 degrees Fahrenheit). If samples are not sufficiently cooled, the analysis may be invalid and additional sampling may be needed. Remember to include one trip blank per cooler.

Analyses

In selecting a laboratory for these analyses, consider the following credentials and capabilities:

Currently certified or registered for Volatile Organics under chapter NR 149, Wis. Adm. Code [WAC];
Methods used are capable of detecting VOCs below the ch. NR 140, Wis. Adm. Code, Preventative Action Limits (PALs), except as noted in the discussion below;
Blanks demonstrate that laboratory contamination is under control;
Ability to report quality control data (surrogates, matrix spikes, duplicates, blanks);
Quality control recoveries within 70 – 130%.

Certification

Laboratories should be able to provide a copy of their certificate that lists their certifications. In addition, you may obtain a list of certified laboratories from the Laboratory Certification page on the DNR web site (http://www.dnr.state.wi.us/org/es/science/lc/search/.

Method Detection Limits for VOCs

As you select a laboratory, consider whether their VOC method is capable of detecting the target substances below their respective PALs. Laboratories should be able to provide a list of their method detection limits. The laboratory selected should have detection limits of 0.2 µg/L or below for the list of volatiles. Based on a survey of laboratories in the certification program, about half of the laboratories are capable of meeting these expectations. The following substances have PALs below 0.2 µg/L:

Substance	CAS Number	PAL (µg/L)	Target MDL (µg/L)
Bromodichloromethane	75-27-4	0.06	0.15
1,3-Dichloropropene(cis & trans)	10061-01-5		
	10061-02-6	0.02	0.15
1,1,2,2-Tetrachloroethane	79-34-5	0.02	0.15
Vinyl chloride	75-01-4	0.02	0.15

DNR recognizes that few laboratories are capable of achieving detection limits below the PALs for these substances. Our laboratory survey suggests that about 25% of certified laboratories can achieve detection limits of 0.15 µg/L for these substances and so we suggest this be the target detection limit for the above substances. Remember that s. NR 507.26, Wis. Adm. Code, requires all results be reported to the laboratory's method detection limit, even in cases where the laboratory's method detection limit is lower than the PAL.

Blanks

Field and laboratory method blanks provide an indication of whether sampling and analysis have contaminated the samples. Several of the volatiles found in contaminated groundwater are common laboratory contaminants. Ideally, the method blanks that laboratories analyze with samples should be free of contaminants; however, in reality laboratories have varying degrees of success in their efforts to control contamination. Methylene chloride is one of the most problematic contaminants. For results to be useful, methylene chloride contamination in method blanks should be less than 0.2 µg/L. If contamination in method blanks or field blanks exceed 0.5 µg/L (i.e. the PAL), additional monitoring may be necessary. Less commonly found contaminants include benzene, acetone, methyl ethyl ketone, ethyl benzene, toluene, and xylenes. The laboratory certification code, section NR 149.14(3)(d), Wis. Adm. Code, provides guidelines on acceptable levels of contamination. Contamination in excess of 5% of the sample concentration significantly reduces the reliability of the result and may make the result unusable.

Quality Control Results

As a routine quality control practice, laboratories monitor the recoveries of surrogate standards in each sample. The recovery of the surrogates is an indicator of the reliability of the results for the target compounds. When you are selecting a laboratory, we recommend that you closely examine quality control limits. For groundwater, recoveries for surrogates and matrix spikes should generally range between 70% and 130%. Although results outside of this guideline may be acceptable, the decreased reliability may mean that additional samples beyond the recommended number of rounds may be necessary to make a determination. Ask the laboratory to report quality control results along with the sample results

Appendix E:
VOCs and Dissolved Substances Associated with Landfill Leachate

Common name	Param. No.	CAS RN	Synonyms
Acetone	81552	67–64–1	2–Propanone
Benzene	34030	71–43–2	Benzol, benzen, benzole
Bromodichloromethane	32101	75–27–4	Dichlorobromomethane
Bromoform	32104	75–25–2	Tribromomethane
Carbon disulfide	77041	75–15–0	Dithiocarbonic Anhydride
Carbon tetrachloride	32102	56–23–5	Tetrachloromethane
Chlorobenzene	34301	108–90–7	Monochlorobenzene
Chloroethane	34311	75–00–3	Ethyl chloride
Chloroform	32106	67–66–3	Trichloromethane
Dibromochloromethane	32105	124–48–1	Chlorodibromomethane
1,2–Dibromo–3–chloropropane	38437	96–12–8	DBCP
1,2–Dibromoethane	77651	106–93–4	EDB; Ethylene dibromide
o–Dichlorobenzene	34536	95–50–1	1,2–Dichlorobenzene
m–Dichlorobenzene	34566	541–73–1	1,3–Dichlorobenzene
p–Dichlorobenzene	34571	106–46–7	1,4–Dichlorobenzene 8021, 8260
Dichlorodifluoromethane	34668	75–71–8	Freon 12, Difluorodichloromethane
1,1–Dichloroethane	34496	75–34–3	
1,2–Dichloroethane	32103	107–06–2	Ethylene dichloride
1,1–Dichloroethylene	34501	75–35–4	Vinylidene chloride
cis–1,2–Dichloroethylene	77093	156–59–2	cis–1,2–Dichloroethene
Trans–1,2–Dichloroethylene	34546	156–60–5	trans–1,2–Dichloroethene
1,2–Dichloropropane	34541	78–87–5	
cis–1,3–Dichloropropylene	34704	10061–01–5	cis–1,3–Dichloropropene, Z–Dichloropropylene
Trans–1,3–Dichloropropylene	34699	10061–02–6	trans–1,3–Dichloropropene, E–Dichloropropylene
Ethylbenzene	78113	100–41–4	Phenylethane
Methyl bromide	34413	74–83–9	Bromomethane
Methyl chloride	34418	74–87–3	Chloromethane
Methylene bromide	77596	74-95-3	Dibromomethane
Methylene chloride	34423	75–09–2	Dichloromethane
Methyl ethyl ketone	81595	78–93–3	2–Butanone; MEK
Methyl tert–butyl ether	78032	1634–04–4	MTBE
Naphthalene	34696	91–20–3	Camphor Tar, Naphthalin
Styrene	77128	100–42–5	Ethenylbenzene
Tetrachloroethylene	34475	127–18–4	Tetrachloroethene; Perchloroethylene; PCE; Perc
Tetrahydrofuran	81607	109–99–9	THF
Toluene	78131	108–88–3	Methylbenzene
1,1,1–Trichloroethane	34506	71–55–6	Methylchloroform
1,1,2–Trichloroethane	34511	79–00–5	
Trichloroethylene	39180	79–01–6	Trichloroethene; TCE

Trichlorofluoromethane	34488	75–69–4	Fluorotrichloromethane, Freon 11
Vinyl chloride	39175	75–01–4	Chloroethene
Xylenes (total)	81551	1330–20–7	Dimethylbenzene
Sulfate, dissolved	00946	14808-79-8	
Arsenic, dissolved	01000	7440-38-2	
Cadmium, dissolved	01025	7440-43-9	
Chromium, dissolved	01030	7440-47-3	Chrome
Lead, dissolved	01049	7439-92-1	Plumbum
Mercury, dissolved	71890	7439-97-6	Quick silver

Note: Xylenes (total): This entry includes o–xylene (CAS RN 96–47–6), m–xylene (CAS RN 108–38–3), p–xylene (CAS RN 106–42–3), and unspecified xylenes (dimethylbenzenes) (CAS RN 1330–20–7).

Source: Section NR 507, Wisconsin Administrative Code, Appendices III and IV

ATTACHMENT 10

METALS

(Aluminum through Lead)

Sample Location	Sample Date	Sample Number	Filtered versus Unfiltered	units	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
MW-6COR	11/27/95	51101336	unfiltered	ug/l	178	<2 0	1 2 (B)	218	<0 30	<1 0	138000	<4 5	<3 7	5 3 (B)	338	1 7 (B)
	3/19/96	60300673	unfiltered	ug/l	101	<4 0	<1 0	210	<0 20	<1 0	139000	<3 6	<4 0	5 6 (B)	197	<1 0
	3/19/96	60300673	filtered	ug/l	<29 0			205	<0 20		133000	<3 6	<4 0	6 9 (B)	14 2 (B)	
	8/15/96	60800363	filtered	ug/l	<26 4	<2 0 (SJ)	<1 0 (J)	205	<0 12	<1 0	133000	<4 3	<3 1	<4 0	<6 6	<1 0
	11/19/96	61100723	filtered	ug/l	<26 3	<2 0	<1 0	202	<0 30	<1 0	137000	<3 6	<4 9	<4 4	8 5 (BJ)	<1 0
	8/20/97	H7H220192 003	filtered	ug/l	<100	<5 0	<5 0	186	<1 0	<1 0	137000	<5 0	0 47(BUJ)	1 5 (BJ)	<100	<2 0
	11/18/97	H7K190164 003	filtered	ug/l	<100	<5 0	<5 0	192	<1 0	<1 0	157000	0 50 (BUJ)	0 74 (BUJ)	5 5	<100	<2 0
	2/10/98	H8B120173-003	filtered	ug/l	18 3 (BU)	<5 0	<5 0	180	0 29 (BU)	<1 0	159000 (J)	<5 0	<5 0	5 5 (U)	16 5 (BU)	<2 0
	5/11/98	H8E150200-003	filtered	ug/l	<100	<5 0	<5 0	166 (J)	<1 0	<1 0	149000 (J)	<5 0	<5 0	<5 0	<100	<2 0
	12/2/98	H8L030228-028	filtered	ug/l	42 7 (BUJ)	<5 0	<5 0	186	<1 0	<1 0	141000	<5 0	1 3 (BUJ)	<5 0	543	1 3 (BJ)
	5/11/99	H9E120206-17	filtered	ug/l	<200	<5 0	<5 0	153	<1 0	<1 0	135000	<5 0	1 0 (BUJ)	<5 0	<100	<2 0
	11/16/99	H9K180309-023	filtered	ug/l	<200	<5 0	<5 0	140 (J)	0 47 BUJ)	<1 0	119000	<5 0	<5 0	<5 0	<100	<2 0
	5/23/00	HOE300151-006	filtered	ug/l	70 9 (BUJ)	<5 0	<5 0	148 (J)	<1 0	0 24 (BUJ)	128000 (J)	<5 0	0 69 (BUJ)	<5 0	<100	<2 0
	11/8/00	HOK100218-007	filtered	ug/l	35 4 (BJU)	<5 0	<5 0	136	<1 0	<1 0	128000	<5 0	1 6 (BJU)	<5 0	<100	<2 0
	5/8/01	H1E100217-009	filtered	ug/l	35 1 (BJU)	<5 0	<5 0	138	<1 0	<1 0	129000	<5 0	1 4 (BJU)	<5 0	<100	<2 0
MW-6S	11/28/95	51101334	unfiltered	ug/l	425	<2 0	3 4	131	<0 30	<1 0	106000	<4 5	<3 7	<3 3	679	3 3
	3/19/96	60300671	unfiltered	ug/l	45 0 (B)	<4 0	3 5	118	<0 20	<1 0	101000	<3 6	<4 0	5 7 (B)	220	<1 0
	3/19/96	60300671	filtered	ug/l	39 1 (B)			123	<0 20		101000	<3 6	<4 0	4 5 (B)	209	
	8/15/96	60800359	filtered	ug/l	<26 4	<2 0 (J)	2 3 (JU)	116	0 31 (BJU)	<1 0	103000	<4 3	<3 1	<4 0	206	<1 0
	11/19/96	61100725	filtered	ug/l	<26 3	<2 0	2	115	<0 30	<1 0	109000	<3 6	<4 9	<4 4	248	<1 0
	8/20/97	H7H220192-001	filtered	ug/l	33 2 (BUJ)	<5 0	<5 0	110	<1 0	<1 0	107000	<5 0	1 2 (BUJ)	1 6 (BJ)	183	<2 0
(MW DUP)	8/20/97	H7H220192 006	filtered	ug/l	35 8 (BUJ)	<5 0	<5 0	105	<1 0	<1 0	99800	<5 0	1 1 (BUJ)	<5 0	150	<2 0
	11/18/97	H7K190164 001	filtered	ug/l	44 2 (BJU)	<5 0	<5 0	101	<1 0	<1 0	113000	<5 0	1 1 (BU)	5 2	169	<2 0
	2/10/98	H8B120173-001	filtered	ug/l	17 6 (BU)	<5 0	<5 0	97 9	0 23 (BU)	<1 0	119000 (J)	<5 0	0 76 (B)	4 6 (BU)	226	<2 0
	5/11/98	H8E150200-001	filtered	ug/l	26 1 (BJU)	<5 0	<5 0	95 7 (J)	<1 0	<1 0	113000 (J)	<5 0	<5 0	2 5 (BJ)	52 7 (BJU)	<2 0
	12/2/98	H8L030228-026	filtered	ug/l	35 9 (BUJ)	<5 0	3 7 (BUJ)	`99	<1 0	<1 0	112000	<5 0	1 6 (BUJ)	<5 0	65 6 (BJ)	<2 0
	5/11/99	H9E120206-014	filtered	ug/l	<200	4 6 (BUJ)	<5 0	87 1	<1 0	<1 0	100000	<5 0	1 9 (BUJ)	<5 0	<100	<2 0
(MW DUP)	5/11/99	H9E120206-021	filtered	ug/l	<200	<5 0	<5 0	86 7	<1 0	<1 0	102000	<5 0	1 3 (BUJ)	<5 0	<100	<2 0
	11/16/99	H9K180309-013	filtered	ug/l	21 4 (BUJ)	<5 0	3 2 (BJ)	85 9 (J)	0 36 (BUJ)	<1 0	94900	<5 0	1 4 (BUJ)	<5 0	57 2 (JU)	<2 0
	5/23/00	HOE300151-004	filtered	ug/l	58 9 (BUJ)	<5 0	<5 0	88 1 (J)	<1 0	<1 0	101000 (J)	<5 0	0 80 (BUJ)	<5 0	<100	<2 0
	11/8/00	HOK100218-005	filtered	ug/l	35 3 (BJU)	<5 0	<5 0	83 3	<1 0	<1 0	99500	<5 0	2 2 (BJU)	<5 0	43 6 (BJU)	<2 0
	5/8/01	H1E100217 007	filtered	ug/l	37 2 (BJU)	<5 0	<5 0	82 1	<1 0	<1 0	98700	<5 0	1 4 (BJU)	<5 0	<100	<2 0
1988 NR 140 Ground Water Quality Standards		PAL	Not Applicable	ug/l	--	--	5	200	--	1	--	5	--	500	150	5
		ES	Not Applicable	ug/l	--	--	50	1000	--	10	--	50	--	1000	300	50
2001 NR 140 Ground Water Quality Standards		PAL	Not Applicable	ug/l	--	1 2	5	400	0 4	0 5	--	10	8	130	150	1 5
		ES	Not Applicable	ug/l	--	6 0	50	2000	4 0	5 0	--	100	40	1300	300	15

= Exceeds the PAL (Preventive Action Limit) for **1988**

= Exceeds the ES (Enforcement Standard) for **1988**

197 = Exceeds the PAL (Preventive Action Limit) for **2001**

338 = Exceeds the ES (Enforcement Standard) for **2001**

B- The value listed was detected between the reporting limit and the limit of detection

U- Data validation indicates this value is not a qualified detect and is interpreted as no detect

J- The value listed is estimated due to minor quality control deviations

Filtering was completed with disposable 0 45 micron filters

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METALS (Continued)

(Aluminum through Lead)

Sample Location	Sample Date	Sample Number	Filtered versus Unfiltered	units	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
MW 6D	11/28/95	51101333	unfiltered	ug/l	78 (B)	<2 0	2 3	61	<0 30	<1 0	53200	<4 5	<3 7	3 7 (B)	225	3 3
	3/19/96	60300672	unfiltered	ug/l	40 7 (B)	<4 0	2 3	56 1	<0 20	<1 0	51300	<3 6	<4 0	5 9 (B)	120	<1 0
	3/19/96	60300672	filtered	ug/l	<29 0			59 8	<0 20		50700	<3 6	<4 0	4 3 (B)	109	
	8/16/96	60800445	filtered	ug/l	<26 4	<2 0 (SJ)	<1 0 (J)	56 7	0 20 (BJU)	<1 0	53300	<4 3	<3 1	<4 0	117	<1 0
(MW DUP)	8/16/96	60800449	filtered	ug/l	<26 4	<2 0 (J)	<1 0 (J)	56 3	0 27 (BJU)	<1 0	53700	<4 3	<3 1	<4 0	116	<1 0
	11/19/96	61100724	filtered	ug/l	<26 3	<2 0	3 7	59 1	<0 30	<1 0	56400	<3 6	<4 9	<4 4	69 2 (BJ)	<1 0
	8/20/97	H7H220192 002	filtered	ug/l	24 1 (BUJ)	<5 0	2 9 (B)	56 4	<1 0	<1 0	53200	<5 0	0 98 (BUJ)	1 0 (BJ)	83 4 (BJ)	<2 0
	11/18/97	H7K190184-002	filtered	ug/l	44 9 (BUJ)	<5 0	3 2 (BJ)	55 7	<1 0	<1 0	60000	<5 0	0 75 (BUJ)	5 2	137	<2 0
	2/10/98	H8B120173-002	filtered	ug/l	25 9 (BU)	<5 0	2 8 (BJ)	52	0 40 (BU)	<1 0	59600 (J)	<5 0	<5 0	5 1 (U)	152	<2 0
	5/13/98	H8E150200-002	filtered	ug/l	25 9 (BJU)	<5 0	<5 0	52 6 (J)	<1 0	<1 0	58300 (J)	<5 0	<5 0	<5 0	160 (J)	<2 0
	12/1/98	H8L030228-027	filtered	ug/l	34 7 (BUJ)	<5 0	3 8 (BUJ)	55 9	<1 0	<1 0	54500	<5 0	0 76 (BUJ)	<5 0	76 0 (BJ)	<2 0
	5/11/99	H9E120208-019	filtered	ug/l	<200	<5 0	<5 0	50 9	<1 0	<1 0	51000	<5 0	1 1 (BUJ)	<5 0	<100	<2 0
	11/16/99	H9K180309-024	filtered	ug/l	25 1 (BUJ)	<5 0	3 0 (BUJ)	50 1 (J)	0 47 (BUJ)	<1 0	46100	<5 0	0 47 (BUJ)	<5 0	148 (J)	<2 0
	5/24/00	HOE300151 008	filtered	ug/l	70 4 (BUJ)	<5 0	<5 0	53 4 (J)	<1 0	<1 0	49400 (J)	<5 0	0 83 (BUJ)	<5 0	25 7 (BUJ)	<2 0
	11/9/00	HOK100218-009	filtered	ug/l	38 3 (BJU)	<5 0	<5 0	51 8	<1 0	<1 0	48800	<5 0	1 6 (BJU)	<5 0	85 0 (BJ)	<2 0
	5/8/01	H1E100217 005	filtered	ug/l	41 3 (BJU)	<5 0	3 5 (BJ)	52 8	<1 0	<1 0	48600	<5 0	<5 0	<5 0	<100	<2 0
MW 7CO	11/27/95	51200055	unfiltered	ug/l	161	<2 0 (S)	<1 0	212	<0 30	<1 0	141000	<4 5	<3 7	3 5 (B)	461	2 2
	3/18/96	60300610	unfiltered	ug/l	<29 0	<4 0	<1 0	182	<0 20	<1 0	131000	<3 6	<4 0	6 6 (B)	40 4 (B)	1 4 (BU)
	3/18/96	60300610	filtered	ug/l	33 2 (B)			179	<0 20		125000	<3 6	<4 0	6 6 (B)	37 2 (B)	
	8/15/96	60800364	filtered	ug/l	<26 4	<2 0 (J)	<1 0 (J)	197	<0 12	<1 0	129000	<4 3	<3 1	<4 0	29 9 (B)	<1 0
	11/20/96	61100726	filtered	ug/l	<26 3	<2 0	<1 0	197	<0 30	<1 0	133000	<3 6	<4 9	<4 4	<8 0	<1 0
	8/22/97	H7H260142-001	filtered	ug/l	26 9 (BUJ)	<5 0	<5 0	168	<1 0	<1 0	130000	<5 0	<5 0	0 83 (BJ)	<100	<2 0
	11/17/97	H7K190164 008	filtered	ug/l	48 6 (BUJ)	2 0 (BJ)	<5 0	171	<1 0	<1 0	150000	<5 0	0 83 (BJU)	4 6 (BJ)	45 7 (BJU)	<2 0
	2/10/98	H8B120173-005	filtered	ug/l	66 3 (BU)	<5 0	<5 0	175	0 20 (BU)	<1 0	151000 (J)	1 0 (BU)	<5 0	<5 0	65 1 (BU)	<2 0
	5/11/98	H8E150200-008	filtered	ug/l	38 5 (BJU)	<5 0	<5 0	144 (J)	<1 0	<1 0	147000 (J)	<5 0	0 71 (BJU)	<5 0	<100	<2 0
	12/3/98	H8L040143-005	filtered	ug/l	42 3 (BUJ)	<5 0	<5 0	188	<1 0	<1 0	146000	<5 0	0 95 (BJU)	<5 0	<100	<2 0
	5/12/99	H9E130212-002	filtered	ug/l	<200	<5 0	<5 0	172	<1 0	<1 0	145000	<5 0	<5 0	<5 0	<100	<2 0
	11/17/99	H9K180309-026	filtered	ug/l	110 (BUJ)	<5 0	<5 0	141 (J)	0 27 (BUJ)	<1 0	123000	<5 0	0 83 (BUJ)	<5 0	63 1 (BUJ)	<2 0
	5/23/00	HOE300151 021	filtered	ug/l	83 4 (BUJ)	<5 0	<5 0	131 (J)	<1 0	<1 0	139000 (J)	<5 0	<5 0	<5 0	<100	<2 0
(MW DUP)	5/23/00	HOE300151-022	filtered	ug/l	87 7 (BUJ)	<5 0	<5 0	128 (J)	<1 0	<1 0	135000 (J)	<5 0	0 72 (BUJ)	<5 0	<100	<2 0
	11/8/00	HOK100218-014	filtered	ug/l	41 0 (BJU)	<5 0	<5 0	161	<1 0	<1 0	145000	<5 0	1 2 (BJU)	<5 0	<100	<2 0
(MW DUP)	11/8/00	HOK100218-024	filtered	ug/l	48 5 (BJU)	<5 0	<5 0	166	<1 0	<1 0	145000	<5 0	3 8 (BJU)	4 0 (BJ)	<100	<2 0
	5/8/01	H1E100217-024	filtered	ug/l	72 4 (BJU)	<5 0	2 0 (BJ)	122	<1 0	0 38 (BJ)	150000	<5 0	<5 0	<5 0	<100	<2 0
1988 NR 140 Ground Water Quality Standards	PAL	Not Applicable	ug/l	--	--	5	200	--	1	--	5	--	500	150	5
	ES	Not Applicable	ug/l	--	--	50	1000	--	10	--	50	--	1000	300	50
2001 NR 140 Ground Water Quality Standards	PAL	Not Applicable	ug/l	--	1 2	5	400	0 4	0 5	--	10	8	130	150	1 5
	ES	Not Applicable	ug/l	--	6 0	50	2000	4 0	5 0	--	100	40	1300	300	15

= Exceeds the PAL (Preventive Action Limit) for **1988**

= Exceeds the ES (Enforcement Standard) for **1988**

197 = Exceeds the PAL (Preventive Action Limit) for **2001**

338 = Exceeds the ES (Enforcement Standard) for **2001**

B The value listed was detected between the reporting limit and the limit of detection

U Data validation indicates this value is not a qualified detect and is interpreted as no detect

J The value listed is estimated due to minor quality control deviations

Filtering was completed with disposable 0 45 micron filters

METALS (Continued)

(Aluminum through Lead)

Sample Location	Sample Date	Sample Number	Filtered versus Unfiltered	units	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
MW-7S	11/30/95	51200058	unfiltered	ug/l	1880	<2 0	<1 0 (U)	87 9	<0 30	<1 0	48200	<4 5	<3 7	12 4	2520	3 1
	3/18/96	60300611	unfiltered	ug/l	596	<4 0	<1 0	65 6	<0 20	<1 0	36200	<3 6	<4 0	7 8 (B)	673	1 8 (BU)
	3/18/96	60300611	filtered	ug/l	40 5 (B)			72 8	<0 20		33800	<3 6	<4 0	6 6 (B)	17 7 (B)	1 4 (BJ)
	8/15/96	60800365	filtered	ug/l	49 6 (B)	2 1 (BMJU)	1 1 (BJU)	60	0 19 (BJU)	<1 0	34100	<4 3	<3 1	<4 0	68 5 (B)	<1 0
	11/20/96	61100730	filtered	ug/l	<26 3	<2 0	2	69	<0 30	<1 0	34800	<3 6	<4 9	<4 4	<8 0	<1 0
	8/21/97	H7H230120-003	filtered	ug/l	49 0 (BUJ)	<5 0	<5 0	58 8	<1 0	<1 0	33200	<5 0	0 34 (BUJ)	<5 0	24 4 (BUJ)	<2 0
	11/17/97	H7K190184-009	filtered	ug/l	21 9 (BJU)	<5 0	2 2 (BJ)	54 9	<1 0	<1 0	35300	0 53 (BJU)	0 93 (BJU)	5	576	<2 0
	2/10/98	H8B120173-006	filtered	ug/l	48 2 (BU)	<5 0	<5 0	57 7	0 36 (BU)	<1 0	36000 (J)	<5 0	<5 0	1 2 (BU)	20 4 (BU)	<2 0
(MW DUP)	2/10/98	H8B120173-007	filtered	ug/l	18 3 (BU)	<5 0	<5 0	61 4	0 36 (BU)	<1 0	39500 (J)	<5 0	<5 0	3 4 (BU)	29 (BU)	<2 0
	5/11/98	H8E150200-009	filtered	ug/l	22 9 (BJU)	2 6 (BJ)	<5 0	56 6 (J)	<1 0	<1 0	36300 (J)	<5 0	<5 0	<5 0	<100	<2 0
	12/1/98	H8L030228-032	filtered	ug/l	60 8 (BUJ)	<5 0	3 8 (BUJ)	67	<1 0	<1 0	38900	1 2 (BUJ)	1 1 (BUJ)	<5 0	22 9 (BUJ)	<2 0
	5/11/99	H9E120206-023	filtered	ug/l	<200	4 7 (BUJ)	<5 0	51 6	<1 0	<1 0	31500	<5 0	<5 0	<5 0	<100	<2 0
	11/17/99	H9K180309-025	filtered	ug/l	38 4 (BUJ)	<5 0	<5 0	57 5 (J)	0 35 (BUJ)	<1 0	30600	<5 0	1 2 (BUJ)	<5 0	13 4 (BUJ)	<2 0
	5/23/00	H0E300151-010	filtered	ug/l	88 5 (BUJ)	<5 0	<5 0	56 0 (J)	<1 0	<1 0	30600 (J)	0 57 (BUJ)	1 0 (BUJ)	<5 0	<100	<2 0
	11/9/00	H0K100218-012	filtered	ug/l	50 0 (BJU)	<5 0	<5 0	55 2	<1 0	<1 0	30600	<5 0	0 75 (BJU)	<5 0	<100	<2 0
	5/8/01	H1E100217-022	filtered	ug/l	73 7 (BJU)	<5 0	3 2 (BJ)	52 4	<1 0	<1 0	28800	<5 0	<5 0	<5 0	<100	<2 0
MW-8CO	11/30/95	51200059	unfiltered	ug/l	183	<2 0	<1 0	59 6	<0 30	<1 0	363000	<4 5	<3 7	<3 3	279	2 6
	3/18/96	60300608	unfiltered	ug/l	619	<4 0 (J)	1 9 (B)	80 2	<0 20	<1 0	384000	<3 6	<4 0	11 4	778	4 5 (UJ)
	3/18/96	60300608	filtered	ug/l	<29 0			36 5	<0 20		308000	<3 6	5 2 (B)	6 6 (B)	16 1 (B)	1 4 (BJ)
	8/15/96	60800366	filtered	ug/l	<26 4	<2 0 (SJ)	2 5 (SJU)	36 8	0 24 (BJU)	<1 0	326000	<4 3	<3 1	<4 0	<6 6	3 3 (S)
	11/20/96	61100731	filtered	ug/l	<26 3	<2 0	2 0 (BSJ)	38 2	<0 30	<1 0	353000	<3 6	<4 9	<4 4	<8 0	2 7 (SJ)
	8/21/97	H7H230120-001	filtered	ug/l	27 6 (BUJ)	<5 0	<5 0	40	<1 0	<1 0	362000	<5 0	1 8 (BUJ)	1 5 (BJ)	<100	<2 0
	11/17/97	H7K190184-006	filtered	ug/l	42 1 (BJU)	<5 0	<5 0	37 2	<1 0	<1 0	373000	0 76 (BJU)	1 7 (BJU)	<5 0	<100	<2 0
	2/10/98	H8B120173-004	filtered	ug/l	<100	<5 0	<5 0	33 1	<1 0	<1 0	371000 (J)	0 44 (BU)	<5 0	<5 0	<100	<2 0
	5/11/98	H8E150200-008	filtered	ug/l	249 (J)	<5 0	<5 0	31 0 (J)	<1 0	<1 0	343000 (J)	<5 0	1 0 (BJU)	1 7 (BJ)	<100	<2 0
	12/3/98	H8L040143-004	filtered	ug/l	27 3 (BJU)	<5 0	<5 0	38 7 (J)	<1 0	<1 0	245000	<5 0	2 4 (BJU)	<5 0	89 6 (BJ)	<2 0
	5/12/99	H9E130212-004	filtered	ug/l	<200	<5 0	<5 0	38 9	<1 0	<1 0	293000	<5 0	1 4 (BJU)	4 0 (BJU)	<100	<2 0
	11/16/99	H9K180309-027	filtered	ug/l	39 8 (BUJ)	<5 0	<5 0	31 3 (J)	0 24 (BUJ)	<1 0	241000	<5 0	1 4 (BUJ)	<5 0	<100	<2 0
(MW DUP)	11/16/99	H9K180309-031	filtered	ug/l	53 3 (BUJ)	<5 0	<5 0	30 0 (J)	0 21 (BUJ)	<1 0	232000	<5 0	2 0 (BUJ)	<5 0	<100	<2 0
	5/23/00	H0E300151-014	filtered	ug/l	89 5 (BUJ)	<5 0	<5 0	37 4 (J)	<1 0	<1 0	161000 (J)	<5 0	1 0 (BUJ)	1 9 (BJ)	<100	<2 0
	11/8/00	H0K100218-018	filtered	ug/l	39 0 (BJU)	<5 0	<5 0	38 4	<1 0	0 69 (BJ)	191000	<5 0	2 4 (BJU)	2 7 (BJ)	<100	<2 0
	5/8/01	H1E100217-018	filtered	ug/l	<200	<5 0	2 0 (BJ)	37 9	<1 0	<1 0	178000	<5 0	<5 0	2 9 (BJ)	<100	<2 0
(MW DUP)	5/8/01	H1E100217-020	filtered	ug/l	<200	<5 0	<5 0	42 3	<1 0	<1 0	205000	<5 0	0 48 (BJU)	1 0 (BJ)	<100	<2 0
1988 NR 140 Ground Water Quality Standards		PAL	Not Applicable	ug/l	--	--	5	200	--	1	--	5	--	500	150	5
		ES	Not Applicable	ug/l	--	--	50	1000	--	10	--	50	--	1000	300	50
2001 NR 140 Ground Water Quality Standards		PAL	Not Applicable	ug/l	--	1 2	5	400	0 4	0 5	--	10	8	130	150	1 5
		ES	Not Applicable	ug/l	--	6 0	50	2000	4 0	5 0	--	100	40	1300	300	15

= Exceeds the PAL (Preventive Action Limit) for **1988**

= Exceeds the ES (Enforcement Standard) for **1988**

197 = Exceeds the PAL (Preventive Action Limit) for **2001**

338 = Exceeds the ES (Enforcement Standard) for **2001**

B- The value listed was detected between the reporting limit and the limit of detection

U- Data validation indicates this value is not a qualified detect and is interpreted as no detect

J- The value listed is estimated due to minor quality control deviations

Filtering was completed with disposable 0 45 micron filters

METALS (Continued)

(Aluminum through Lead)

Sample Location	Sample Date	Sample Number	Filtered versus Unfiltered	units	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
MW 8D	11/29/95	51200056	unfiltered	ug/l	2560	<2 0	2 3	80 2	<0 30	<1 0	63200	5 7 (B)	<3 7	0 7	4370	4 3
(MW DUP)	11/29/95	51200057	unfiltered	ug/l	2290	<2 0	2 9	76 9	<0 30	<1 0	61500	6 2 (B)	<3 7	8 4 (B)	3730	4 1
	3/18/96	60300609	unfiltered	ug/l	3230	5 5	3 1	80 7	<0 20	<1 0	62700	4 0 (B)	<4 0	13 7	3900	2 6 (U)
	3/18/96	60300609	filtered	ug/l	<29 0			70 7	<0 20		47000	<3 6	<4 0	4 3 (B)	170	2 0 (J)
	8/16/96	60800448	filtered	ug/l	<26 4	<2 0 (J)	<1 0 (J)	56 8	0 19 (BJU)	<1 0	48000	<4 3	<3 1	<4 0	119	<1 0
	11/20/96	61100732	filtered	ug/l	<26 3	<2 0	2 0 (BJ)	59	<0 30	<1 0	48200	<3 6	<4 9	<4 4	90 0 (BJ)	<1 0
(MW DUP)	11/20/96	61100735	filtered	ug/l	<26 3	<2 0	3 1 (M)	57 7	<0 30	<1 0	48700	<3 6	<4 9	<4 4	92 3 (BJ)	<1 0
	8/21/97	H7H230120-002	filtered	ug/l	37 5 (BUJ)	<5 0	1 7 (BJ)	52 9	<1 0	0 77 (BUJ)	49400	<5 0	0 53 (BUJ)	<5 0	68 4 (BUJ)	<2 0
	11/17/97	H7K190164-007	filtered	ug/l	42 7 (BJU)	<5 0	3 3 (BJ)	55	<1 0	<1 0	54800	<5 0	0 81 (BJU)	8 1	122	<2 0
	2/11/98	H8B120173 010	filtered	ug/l	41 6 (BU)	<5 0	2 8 (B)	59 6	0 34 (BU)	<1 0	56200 (J)	0 65 (BU)	<5 0	2 4 (BU)	209	1 4 (BU)
	5/11/98	H8E150200-007	filtered	ug/l	27 8 (BJU)	<5 0	<5 0	54 0 (J)	<1 0	<1 0	52100 (J)	<5 0	0 83 (BJU)	<5 0	147 (J)	<2 0
(MW DUP)	5/11/98	H8E150200-029	filtered	ug/l	<100	<5 0	<5 0	28 6 (J)	<1 0	<1 0	40600 (J)	<5 0	0 82 (BJU)	<5 0	221 (J)	<2 0
	12/1/98	H8L030228-015	filtered	ug/l	47 7 (BUJ)	<5 0	4 3 (BUJ)	60	<1 0	<1 0	50400	<5 0	0 96 (BUJ)	<5 0	158 (J)	<2 0
	5/11/99	H9E120206-025	filtered	ug/l	<200	<5 0	2 9 (B)	52 3	<1 0	<1 0	46700	<5 0	<5 0	<5 0	107	<2 0
	11/16/99	H9K180309-038	filtered	ug/l	38 1 (BUJ)	<5 0	3 7 (BUJ)	55 8 (J)	0 44 (BUJ)	<1 0	44400	<5 0	1 2 (BUJ)	<5 0	128 (U)	<2 0
	5/23/00	HOE300151 016	filtered	ug/l	77 1 (BUJ)	<5 0	1 9 (BJ)	59 0 (J)	<1 0	<1 0	48800 (J)	<5 0	1 1 (BUJ)	<5 0	91 4 (BUJ)	<2 0
	11/8/00	HOK100218-018	filtered	ug/l	37 6 (BJU)	<5 0	<5 0	54 8	<1 0	<1 0	47300	<5 0	3 0 (BJU)	<5 0	136	<2 0
	5/8/01	H1E100217-015	filtered	ug/l	36 5 (BJU)	<5 0	3 3 (BJ)	58	<1 0	<1 0	47400	<5 0	<5 0	<5 0	88 9 (BJ)	<2 0
MW 9S	11/29/95	51200054	unfiltered	ug/l	6110	<2 0	<1 0	76 4	0 44 (B)	<1 0	42500	13	<3 7	16 2	7510	5 8
	3/18/96	60300606	unfiltered	ug/l	1380	<4 0	<1 0	43 5	<0 20	<1 0	27500	<3 6	<4 0	7 3 (B)	1350	1 2 (BU)
(MW DUP)	3/18/96	60300612	unfiltered	ug/l	1480	<4 0	<1 0	46 2	<0 20	<1 0	28800	<3 6	<4 0	6 6 (B)	1490	2 3 (UJ)
	3/18/96	60300606	filtered	ug/l	91 9 (B)			39 9	<0 20		26100	<3 6	<4 0	4 5 (B)	72 4 (B)	
(MW DUP)	3/18/96	60300612	filtered	ug/l	74 5 (B)			38 1	<0 20		25600	<3 6	<4 0	3 6 (B)	85 5 (B)	1 1 (BJ)
	8/16/96	60800446	filtered	ug/l	<26 4	<2 0 (J)	<1 0 (J)	36 1	<0 12	<1 0	25400	<4 3	<3 1	<4 0	<6 6	<1 0
	11/19/96	61100734	filtered	ug/l	<26 3	<2 0	<1 0	32 4	<0 30	<1 0	24600	<3 6	<4 9	<4 4	<8 0	<1 0
	8/20/97	H7H220192 004	filtered	ug/l	16 7 (BUJ)	<5 0	2 2 (BJ)	30 9	<1 0	<1 0	23300	<5 0	0 57 (BUJ)	<5 0	<100	1 1 (BUJ)
	11/17/97	H7K190164-004	filtered	ug/l	56 2 (BJU)	<5 0	<5 0	29 5	<1 0	<1 0	24600	<5 0	0 42 (BJU)	2 3 (BJ)	11 6 (BJU)	<2 0
(MW DUP)	11/17/97	H7K190164-010	filtered	ug/l	52 9 (BJU)	<5 0	<5 0	29 8	<1 0	<1 0	24000	0 81 (BJU)	0 98 (BJU)	5 4	24 2 (BJU)	<2 0
	2/11/98	H8B120173-008	filtered	ug/l	48 (BU)	<5 0	<5 0	31 8	0 39 (BU)	<1 0	25800 (J)	<5 0	<5 0	1 7 (BU)	61 5 (U)	<2 0
	5/11/98	H8E150200-004	filtered	ug/l	19 3 (BJU)	<5 0	<5 0	28 7 (J)	<1 0	<1 0	24500 (J)	<5 0	0 71 (BJU)	<5 0	24 2 (BJU)	<2 0
	12/1/98	H8L030228-029	filtered	ug/l	44 6 (BUJ)	<5 0	<5 0	31 8 (J)	<1 0	<1 0	23800	<5 0	0 98 (BUJ)	<5 0	<100	<2 0
(MW DUP)	12/1/98	H8L030228-033	filtered	ug/l	38 9 (BUJ)	<5 0	<5 0	31 3 (J)	<1 0	<1 0	22700	<5 0	0 60 (BUJ)	<5 0	<100	<2 0
	5/11/99	H9E120206-027	filtered	ug/l	<200	<5 0	<5 0	26 6	<1 0	<1 0	20700	<5 0	<5 0	<5 0	<100	<2 0
	11/16/99	H9K180309-029	filtered	ug/l	36 6 (BUJ)	<5 0	<5 0	27 8 (J)	0 43 (BUJ)	<1 0	18900	<5 0	1 6 (BUJ)	<5 0	21 9 (BUJ)	<2 0
	5/23/00	HOE300151 018	filtered	ug/l	80 3 (BUJ)	<5 0	<5 0	28 1 (J)	<1 0	<1 0	20000 (J)	<5 0	0 84 (BUJ)	<5 0	<100	<2 0
	11/8/00	HOK100218-020	filtered	ug/l	48 2 (BJU)	<5 0	<5 0	27 6	<1 0	<1 0	20200	<5 0	4 0 (BJU)	<5 0	<100	<2 0
	5/8/01	H1E100217 011	filtered	ug/l	61 0 (BJU)	<5 0	<5 0	26 7	<1 0	<1 0	19500	<5 0	<5 0	<5 0	<100	<2 0
1988 NR 140 Ground Water Quality Standards	PAL	Not Applicable		ug/l	--	--	5	200	--	1	--	5	--	500	150	5
	ES	Not Applicable		ug/l	--	--	50	1000	--	10	--	50	--	1000	300	50
2001 NR 140 Ground Water Quality Standards	PAL	Not Applicable		ug/l	--	1 2	5	400	0 4	0 5	--	10	8	130	150	1 5
	ES	Not Applicable		ug/l	--	6 0	50	2000	4 0	5 0	--	100	40	1300	300	15

= Exceeds the PAL (Preventive Action Limit) for **1988**

= Exceeds the ES (Enforcement Standard) for **1988**

197 = Exceeds the PAL (Preventive Action Limit) for **2001**

338 = Exceeds the ES (Enforcement Standard) for **2001**

B The value listed was detected between the reporting limit and the limit of detection

U- Data validation indicates this value is not a qualified detect and is interpreted as no detect

J- The value listed is estimated due to minor quality control deviations

Filtering was completed with disposable 0 45 micron filters

METALS (Continued)

(Aluminum through Lead)

Sample Location	Sample Date	Sample Number	Filtered versus Unfiltered	units	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
MW 9D	11/28/95	51101335	unfiltered	ug/l	49 5 (B)	<2 0	2	50 7	<0 30	<1 0	39600	<4 5	<3 7	<3 3	178	2 8
	3/48/96	60300607	unfiltered	ug/l	880	<4 0	2 2	50 4	<0 20	<1 0	38500	<3 6	<4 0	9 2 (B)	1070	1 5 (BU)
	3/48/96	60300607	filtered	ug/l	31 6 (B)			58 3	<0 20		36700	<3 6	<4 0	6 1 (B)	164	1 0 (BJ)
	8/16/96	60800447	filtered	ug/l	<26 4	<2 0 (J)	<1 0 (J)	45	0 20 (BJU)	<1 0	37900	<4 3	<3 1	<4 0	153	<1 0
	11/19/96	61100733	filtered	ug/l	<26 3	<2 0	2 8	43 6	<0 30	<1 0	37900	<3 6	<4 9	<4 4	127	<1 0
	8/20/97	H7H220192-005	filtered	ug/l	31 3 (BUJ)	<5 0	3 3 (BJ)	46 3	<1 0	<1 0	38600	<5 0	0 89 (BUJ)	<5 0	79 3 (BJ)	<2 0
	11/17/97	H7K190184-005	filtered	ug/l	141 (U)	<5 0	<5 0	52 7	<1 0	<1 0	45500	<5 0	0 60 (BJU)	2 3 (BJ)	158	<2 0
	2/11/98	H8B120173 009	filtered	ug/l	61 1 (BU)	<5 0	<5 0	51 4	0 34 (BU)	1 7	46500 (J)	<5 0	<5 0	<5 0	58 5 (BU)	10 3
	5/11/98	H8E150200-005	filtered	ug/l	18 4 (BJU)	<5 0	<5 0	47 3 (J)	<1 0	<1 0	42800 (J)	<5 0	0 98 (BJU)	<5 0	17 7 (BJU)	<2 0
	12/1/98	H8L030228-030	filtered	ug/l	53 1 (BUJ)	<5 0	<5 0	51 4 (J)	<1 0	<1 0	40400	<5 0	0 97 (BUJ)	<5 0	<100	<2 0
	5/11/99	H9E120206-029	filtered	ug/l	<200	<5 0	<5 0	38 7	<1 0	<1 0	34600	<5 0	<5 0	<5 0	128	<2 0
	11/16/99	H9K180309-030	filtered	ug/l	44 4 (BUJ)	<5 0	5 2 (U)	42 9 (J)	0 50 (BUJ)	<1 0	31400	<5 0	1 8 (BUJ)	<5 0	45 3 (BUJ)	<2 0
	5/23/00	HOE300151 020	filtered	ug/l	95 1 (BUJ)	<5 0	<5 0	47 8 (J)	<1 0	<1 0	34100 (J)	<5 0	0 99 (BUJ)	<5 0	<100	<2 0
	11/8/00	HOK100218-022	filtered	ug/l	47 6 (BJU)	<5 0	<5 0	43	<1 0	<1 0	34800	<5 0	2 7 (BJU)	<5 0	<100	<2 0
	5/8/01	H1E100217 013	filtered	ug/l	35 3 (BJU)	<5 0	1 7 (BJ)	43 9	<1 0	<1 0	34200	<5 0	<5 0	<5 0	<100	<2 0
PW 01	11/27/95	51101338	unfiltered	ug/l	41 4 (B)	<2 0 (J)	1 2 (B)	32	<0 30	<1 0	40300	<4 5	<3 7	11 5 (J)	432 (J)	3 3 (J)
(PW 01 DUP)	11/27/95	51101342	unfiltered	ug/l	<35 4	<2 0 (J)	1 9	30 6	<0 30	<1 0	39200	<4 5	<3 7	6 0 (BJ)	318 (J)	1 8 (BJ)
	3/18/96	60300614	unfiltered	ug/l	39 5	4 1 (BJ)	<1 0	30 6	<0 20	<1 0	38400	<3 6	<4 0	12 8	390	1 7 (BU)
(PW 01 DUP)	3/18/96	60300613	unfiltered	ug/l	31 6 (B)	37 6 (J)	<1 0	30 1	<0 20	<1 0	37300	<3 6	<4 0	16 1	373	1 4 (BU)
	3/18/96	60300613	filtered	ug/l	<29 0			29 7	<0 20		38300	<3 6	<4 0	12 5	361	3 3 (J)
(PW 01 DUP)	3/18/96	60300613	filtered	ug/l	<29 0			30 2	<0 20		38200	<3 6	<4 0	12 2	363	
	8/14/96	60800357	filtered	ug/l	<26 4	<2 0 (J)	2 1 (JU)	30 5	0 16 (BJU)	<1 0	39500	<4 3	<3 1	<4 0	292	<1 0
(PW 01 DUP)	8/14/96	60800358	filtered	ug/l	<26 4	<2 0 (J)	<1 0 (SJ)	30 5	0 20 (BJU)	<1 0	39500	<4 3	<3 1	6 4 (B)	287	<1 0
	11/21/96	61100720	unfiltered	ug/l	<26 3	<2 0	1 2 (BJ)	31 4	<3 0	<1 0	40300	<3 6	<4 9	5 7 (BJ)	341	<1 0
	11/21/96	61100720	filtered	ug/l											210	
(PW 01 DUP)	11/21/96	61100721	unfiltered	ug/l	<26 3	<2 0	1 0 (BJ)	31 3	<3 0	<1 0	40100	<3 6	<4 9	9 4 (BJ)	355	<1 0
(PW 01 DUP)	11/21/96	61100721	filtered	ug/l											192	
	8/22/97	H7H260142 002	unfiltered	ug/l	<100	<5 0	<5 0	30 9	<1 0	<1 0	34800	<5 0	<5 0	3 6 (BJ)	348	<2 0
	8/22/97	H7H260142 004	filtered	ug/l											363	
	11/18/97	H7K190184 011	unfiltered	ug/l	21 9 (BJU)	<5 0	<5 0	29 8	<1 0	<1 0	41000	<5 0	0 63 (BJU)	17 3	322	2 4 (U)
	11/18/97	H7K190184-011	filtered	ug/l											80 7 (BJ)	
	2/12/98	H8B130179-002	unfiltered	ug/l	<100	<5 0	<5 0	29 3	<1 0	<1 0	43100	<5 0	<5 0	21	486	<2 0
	2/12/98	H8B130179-002	filtered	ug/l											50 5 (BU)	
	5/12/98	H8E150200-011	filtered	ug/l	35 5 (BJU)	<5 0	2 8 (BJ)	54 3 (J)	<1 0	<1 0	54300 (J)	<5 0	<5 0	<5 0	130 (J)	<2 0
	12/1/98	H8L030228-020	unfiltered	ug/l	38 0 (BUJ)	<5 0	4 0 (BUJ)	32 1 (J)	<1 0	<1 0	37900	<5 0	<5 0	5 6 (U)	334 (J)	<2 0
	5/10/99	H9E120206-003	unfiltered	ug/l	<200	<5 0	<5 0	28 2	<1 0	<1 0	34800	<5 0	2 1 (BUJ)	38 7	300	12 3
1988 NR 140 Ground Water Quality Standards	PAL	Not Applicable	ug/l	--	--	5	200	--	1	--	5	--	500	150	5
	ES	Not Applicable	ug/l	-	--	50	1000	--	10	--	50	--	1000	300	50
2001 NR 140 Ground Water Quality Standards	PAL	Not Applicable	ug/l	--	1 2	5	400	0 4	0 5	--	10	8	130	150	1 5
	ES	Not Applicable	ug/l	--	6 0	50	2000	4 0	5 0	--	100	40	1300	300	15

= Exceeds the PAL (Preventive Action Limit) for **1988**

= Exceeds the ES (Enforcement Standard) for **1988**

197 = Exceeds the PAL (*Preventive Action Limit*) for **2001**

338 = Exceeds the ES (Enforcement Standard) for **2001**

B- The value listed was detected between the reporting limit and the limit of detection

U Data validation indicates this value is not a qualified detect and is interpreted as no detect

J The value listed is estimated due to minor quality control deviations

Filtering was completed with disposable 0 45 micron filters

METALS (Continued)

(Aluminum through Lead)

Sample Location	Sample Date	Sample Number	Filtered versus Unfiltered	units	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
LEACHATE	11/30/95	51200060	unfiltered	ug/l	134	<2 6 (B)	2 9	59 7	<0 30	<1 0	8000	<4 5	<3 7	7 3 (B)	207	2 1
	3/19/96	60300675	unfiltered	ug/l	332	<4 0	2 5	61 5	<0 20	<1 0	220000	<3 6	<4 0	9 2 (B)	354	2 6 (UJ)
	3/19/96	60300675	filtered	ug/l	39 7 (B)			55 3	<0 20		198000	<3 6	<4 0	8 3 (B)	16 8 (B)	2 3 (J)
	8/14/96	60800368	unfiltered	ug/l	75 5 (B)	2 2 (BMJU)	2 0 (BSJU)	60 1	0 30 (BJU)	<1 0	300000	<4 3	<3 1	9 0 (B)	137	1 0 (B)
	8/14/96	60800368	filtered	ug/l	<26 4	<2 0 (J)	2 3 (SJU)	62	0 16 (BJU)	<1 0	291000	<4 3	<3 1	<4 0	<6 6	<1 0
	11/21/96	61100737	unfiltered	ug/l	33 3 (BUJ)	<2 0	2 9 (M)	50 4	<0 30	<1 0	259000	<3 6	<4 9	4 4 (BJ)	71 5 (BJ)	3 0
	11/21/96	61100738	filtered	ug/l	<26 3	<2 0	3 0 (M)	50 2	<0 30	<1 0	256000	<3 6	<4 9	5 2 (BJ)	<8 0	<1 0
	11/21/96	61100739	filtered	ug/l											<8 0	
	8/21/97	H7H230120-008	unfiltered	ug/l	298 (U)	<5 0	<5 0	52 2	<1 0	<1 0	193000	<5 0	0 91 (BUJ)	1 7 (BJ)	324	<2 0
	8/21/97	H7H230120-017	filtered	ug/l											<100	
	11/18/97	H7K190184-012	unfiltered	ug/l	45 1 (BJU)	<5 0	<5 0	45 9	<1 0	<1 0	214000	<5 0	0 75 (BJU)	1 6 (BJ)	120	<2 0
	11/18/97	H7K190184-012	filtered	ug/l											367	
	2/9/98	H8B100135-003	unfiltered	ug/l	34 3 (BU)	<5 0	<5 0	40 1	<1 0	<1 0	222000	<5 0	0 79 (BJ)	2 9 (BU)	83 7 (BU)	<2 0
	2/9/98	H8B100135 003	filtered	ug/l											148	
	5/12/98	H8E150200-012	filtered	ug/l	80 4 (BJU)	<5 0	<5 0	55 5 (J)	<1 0	<1 0	224000 (J)	<5 0	<5 0	<5 0	259	<2 0
	12/2/98	H8L030228-018	unfiltered	ug/l	81 3 (BUJ)	<5 0	3 7 (BUJ)	46 3 (J)	<1 0	<1 0	183000	<5 0	0 87 (BUJ)	<5 0	135 (J)	<2 0
	12/2/98	H8L030228-019	filtered	ug/l											<100	
	5/10/99	H9E120206-001	unfiltered	ug/l	<200	<5 0	<5 0	43	<1 0	<1 0	176000	<5 0	0 89 (BUJ)	<5 0	<100	<2 0
	11/17/99	H9K180309-001	unfiltered	ug/l	565 (J)	<5 0	18 6 (J)	275 (J)	0 42 (BUJ)	<1 0	151000	1 9 (BJ)	5 4 (J)	2 8 (BJ)	52300 (J)	27 3
	11/17/99	H9K180309-002	filtered	ug/l											<100	
	5/24/00	H0E300151 001	unfiltered	ug/l	75 1 (BUJ)	<5 0	2 8 (BJ)	86 0 (J)	<1 0	<1 0	164000 (J)	4 5 (BUJ)	1 6 (BUJ)	3 2 (BJ)	5880 (J)	5 2
	5/24/00	H0E300151-002	filtered	ug/l											1100 (J)	
	11/9/00	H0K100218-001	unfiltered	ug/l	61 7 (BUJ)	<5 0	<5 0	87 8	<1 0	<1 0	145000	<5 0	2 1 (BJU)	1 9 (BJU)	6970	<2 0
	5/8/01	H1E100217 002	filtered	ug/l											158	
	5/8/01	H1E100217-001	unfiltered	ug/l	58 1 (BUJ)	<5 0	2 7 (BJ)	96 4	<1 0	<1 0	158000	<5 0	0 63 (BJU)	<5 0	5150	<2 0
1988 NR 140 Ground Water Quality Standards	PAL	Not Applicable	ug/l	--	--	5	200	--	1	--	5	--	500	150	5
	ES	Not Applicable	ug/l	--	--	50	1000	--	10	--	50	--	1000	300	50
2001 NR 140 Ground Water Quality Standards	PAL	Not Applicable	ug/l	--	1 2	5	400	0 4	0 5	--	10	8	130	150	1 5
	ES	Not Applicable	ug/l	--	6 0	50	2000	4 0	5 0	--	100	40	1300	300	15

= Exceeds the PAL (Preventive Action Limit) for **1988**

= Exceeds the ES (Enforcement Standard) for **1988**

197 = Exceeds the PAL (Preventive Action Limit) for **2001**

338 = Exceeds the ES (Enforcement Standard) for **2001**

B- The value listed was detected between the reporting limit and the limit of detection

U- Data validation indicates this value is not a qualified detect and is interpreted as no detect

J- The value listed is estimated due to minor quality control deviations

Filtering was completed with disposable 0 45 micron filters

METALS (Continued)

(Aluminum through Lead)

Sample Location	Sample Date	Sample Number	Filtered versus Unfiltered	units	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
SW-UP	11/29/95	51200061	unfiltered	ug/l	41 0 (B)	<38 5	<1 0	80 9 (B)	<0 30	<3 6	104000	<4 5	<3 7	<3 3	83 3 (B)	<1 0 (J)
	3/20/96	60300683	unfiltered	ug/l	249	<37 6	<1 0	99 9 (B)	<0 20	<4 0	138000	<3 6	<4 0	3 7 (BU)	710	1 7 (BJ)
(SW DUP)	3/20/96	60300684	unfiltered	ug/l	256	<37 6	<1 0	99 1 (B)	<0 20	<4 0	137000	<3 6	<4 0	<3 4	722	1 8 (BJ)
	11/20/96	61100740	unfiltered	ug/l	259	<29 7	1 1 (BJ)	57 2 (BJ)	<0 30	<3 7	82200	<3 6	<4 9	<4 4	1270	3 4
	11/20/96	61100740	filtered	ug/l											686	
	8/21/97	H7H230120-005	unfiltered	ug/l	265 (UJ)	2 4 (BUJ)	<5 0	172 (J)	<1 0	<1 0	57000	1 6 (BUJ)	2 0 (BUJ)	11	1400 (J)	<2 0
	8/21/97	H7H230120-014	filtered	ug/l											26 2 (BUJ)	
(SW DUP)	8/21/97	H7H230120-007	unfiltered	ug/l	621	<5 0	<5 0	44 1	<1 0	<1 0	53700	1 3 (BUJ)	1 2 (BUJ)	10 4	1110	2 6 (U)
(SW DUP)	8/21/97	H7H230120-016	filtered	ug/l											<100	
	2/9/98	H8B100135-001	unfiltered	ug/l	411	<5 0	<5 0	71 4	<1 0	<1 0	114000	1 2 (BU)	0 63 (BJ)	5 6 (U)	874	1 0 (BU)
	2/9/98	H8B100135-001	filtered	ug/l											63 1 (BU)	
	11/30/98	H8L030228-004	unfiltered	ug/l	646 (J)	<5 0	2 9 (BUJ)	67 2	<1 0	<1 0	84800	<5 0	1 8 (BUJ)	<5 0	1010 (J)	2 6
	11/30/98	H8L030228-004	filtered	ug/l											108 (J)	
(SW DUP)	11/30/98	H8L030228-006	unfiltered	ug/l	957 (J)	<5 0	3 4 (BUJ)	72 5	<1 0	<1 0	88100	1 2 (BUJ)	2 1 (BUJ)	<5 0	1480 (J)	3 3
(SW DUP)	11/30/98	H8L030228-006	filtered	ug/l											91 2 (BJ)	
	5/10/99	H9E120206-008	unfiltered	ug/l	36 8 (BJ)	<5 0	<5 0	72 5	<1 0	<1 0	95300	<5 0	1 7 (BUJ)	2 5 (BJ)	548	<2 0
	11/16/99	H9K180309-008	unfiltered	ug/l	1100 (J)	<5 0	<5 0	55 6 (J)	0 54 (BUJ)	<1 0	60000	0 61 (BJ)	1 9 (BUJ)	<5 0	1760 (J)	2 5
	11/16/99	H9K180309-007	filtered	ug/l											49 6 (BUJ)	
(SW DUP)	11/16/99	H9K180309-008	unfiltered	ug/l	1540 (J)	<5 0	<5 0	57 5 (J)	0 57 (BUJ)	<1 0	60100	1 5 (BJ)	2 1 (BUJ)	<5 0	2210 (J)	3
(SW DUP)	11/16/99	H9K180309-009	filtered	ug/l											28 2 (BUJ)	
	5/24/00	HOE300151 028	unfiltered	ug/l	303 (U)	<5 0	<5 0	52 2 (J)	<1 0	<1 0	66300 (J)	<5 0	0 86 (BUJ)	<5 0	419 (J)	<2 0
	5/24/00	HOE300151 029	filtered	ug/l											27 3 (BUJ)	
(SW DUP)	5/24/00	HOE300151-030	unfiltered	ug/l	270 (U)	<5 0	<5 0	52 1 (J)	<1 0	<1 0	66800 (J)	0 57 (BUJ)	1 1 (BUJ)	<5 0	388 (J)	<2 0
(SW DUP)	5/24/00	HOE300151 031	filtered	ug/l											27 8 (BUJ)	
SW DOWN	12/4/95	51200120	unfiltered	ug/l	<35 4	<38 5	<1 0	64 7 (B)	<0 30	<3 6	92600	<4 5	<3 7	4 6 (B)	38 5 (B)	<1 0
(SW DUP)	12/4/95	51200124	unfiltered	ug/l	<35 4	<38 5	1 4 (BJ)	67 (B)	<0 30	<3 6	92700	<4 5	<3 7	<3 3	35 8 (B)	<1 0
	3/20/96	60300679	unfiltered	ug/l	250	<37 6	<1 0	102 (B)	<0 20	<4 0	144000	<3 6	<4 0	3 7 (BU)	746	2 1 (BJ)
	11/20/96	61100744	unfiltered	ug/l	363 (J)	<29 7	1 7 (BJ)	59 8 (BJ)	0 47 (BJ)	<3 7	87600	<3 6	<4 9	4 8 (BJ)	1290	3 0 (BJ)
	11/20/96	61100744	filtered	ug/l											680	
(SW DUP)	11/20/96	61100745	unfiltered	ug/l	295 (J)	<29 7	2 0 (BJ)	59 8 (BJ)	0 31 (BJ)	<3 7	87600	<3 6	<4 9	4 7 (BJ)	1270	3 2 (M)
(SW DUP)	11/20/96	61100745	filtered	ug/l											662	
	8/21/97	H7H230120-008	unfiltered	ug/l	148 (UJ)	<5 0	<5 0	45 3 (J)	<1 0	<1 0	58700	<5 0	0 84 (BUJ)	<5 0	413 (J)	2 1 (U)
	8/21/97	H7H230120-015	filtered	ug/l											<100	
	2/9/98	H8B100135-002	unfiltered	ug/l	263	<5 0	<5 0	73 5	<1 0	<1 0	118000	0 87 (BU)	1 3 (BJ)	9 8	607	1 9 (BU)
	2/9/98	H8B100135-002	filtered	ug/l											81 1 (BU)	
(SW DUP)	2/9/98	H8B100135-004	unfiltered	ug/l	244	<5 0	<5 0	72 3	<1 0	<1 0	118000	0 78 (BU)	<5 0	6 0 (U)	587	1 5 (BU)
(SW DUP)	2/9/98	H8B100135-004	filtered	ug/l											60 (BU)	
	11/30/98	H8L030228-008	unfiltered	ug/l	793 (J)	<5 0	<5 0	74 1	<1 0	<1 0	90700	<5 0	1 7 (BUJ)	<5 0	1160 (J)	<2 0
	11/30/98	H8L030228-008	filtered	ug/l											104 (J)	
	5/10/99	H9E120206-010	unfiltered	ug/l	284	<5 0	<5 0	71 4	<1 0	<1 0	96600	<5 0	0 90 (BUJ)	2 2 (BJ)	751	<2 0
(SW DUP)	5/10/99	H9E120206-012	unfiltered	ug/l	206	<5 0	2 2 (BJ)	69 9	<1 0	<1 0	94900	<5 0	1 62 (BUJ)	2 2 (BJ)	704	<2 0
	11/16/99	H9K180309-010	unfiltered	ug/l	563 (J)	<5 0	<5 0	47 0 (J)	0 44 (BUJ)	<1 0	58100	0 55 (BJ)	2 0 (BUJ)	<5 0	1010 (J)	<2 0
	11/16/99	H9K180309-011	filtered	ug/l											39 8 (BUJ)	
	5/24/00	HOE300151-032	unfiltered	ug/l	414 (U)	<5 0	<5 0	53 4 (J)	<1 0	<1 0	67200 (J)	<5 0	<5 0	<5 0	551 (J)	<2 0
	5/24/00	HOE300151-033	filtered	ug/l											60 8 (BUJ)	
1988 NR 140 Ground Water Quality Standards	PAL	Not Applicable	ug/l	--	--	5	200	--	1	--	5	--	500	150	5
	ES	Not Applicable	ug/l	--	--	50	1000	--	10	--	50	--	1000	300	50
2001 NR 140 Ground Water Quality Standards	PAL	Not Applicable	ug/l	--	1 2	5	400	0 4	0 5	--	10	8	130	150	1 5
	ES	Not Applicable	ug/l	--	6 0	50	2000	4 0	5 0	--	100	40	1300	300	15

= Exceeds the PAL (Preventive Action Limit) for **1988**

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Filtering was completed with disposable 0 45 micron filters

METALS (continued)

(Aluminum through Lead)

Sample Location	Sample Date	Sample Number	Filtered versus Unfiltered	units	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
SED UP	11/29/95	51101327	Not Applicable	mg/kg	11600	<10 1	3 2	66 4	0 59 (B)	1 1 (B)	34800	20 8	8 9 (B)	15 7	19700	27 5
	3/19/96	60300669	Not Applicable	mg/kg	14800	<10 5	3 8	113	0 91 (BJ)	<1 1	7590	26 2	16	23 9	30100	22 3
	11/21/96	61100746	Not Applicable	mg/kg	1610	<8 4	3 5	95 7 (E)	0 83 (BJ)	<1 1 (N)	11000	28 6	12 3 (BJ)	20 8	23800	23
	8/19/97	5660901	Not Applicable	mg/kg	8580	6 1 (JN)	2 8 (JN)	65 3	0 48 (BJ)	<1 3	16500	18 7	8 3 (BJ)	24 1	16800	42 6 (S)
	2/12/98	5911501	Not Applicable	mg/kg	11700	<5 6 (JN)	4 8 (J*)	95 7	<0 24	<1 2	29100 (J)	25 3	11 6 (BJ)	27 5	23500	45 2 (J)
	11/30/98	H8L030228-001	Not Applicable	mg/kg	6020	<18 8 (J)	4 9	57 3 (BJ)	0 40 (BJ)	<1 6	10600	14	12 0 (BJ)	15 8	15900	21 8
	5/10/99	H9E120206-005	Not Applicable	mg/kg	6120	<20 3	5 8	58 1 (BJ)	0 45 (BJ)	<1 7	10900	14	7 3 (BJ)	27 3 (J)	16900 (J)	28 2
	11/16/99	H9K180309-003	Not Applicable	mg/kg	4640 (J)	<18 0 (J)	6 3	39 6 (BJ)	0 54 (BUJ)	<1 5	5520 (J)	9 4	5 3 (BJ)	9 8	16100 (J)	16 7
	5/24/00	HOE300151-025	Not Applicable	mg/kg	7410 (J)	<16 9	4 9	68	0 51 (BJ)	0 25 (BJ)	8150	15 6 (J)	8 1 (BJ)	16 1	16500 (J)	29 1 (J)
(SED DUP)	5/24/00	HOE300151 028	Not Applicable	mg/kg	4880 (J)	<16 7	5 4	41 1 (BJ)	0 41 (BJ)	0 19 (BJ)	7950	11 3 (J)	7 1 (BJ)	10 1	16900 (J)	18 8 (J)
SED DOWN	11/29/95	51101331	Not Applicable	mg/kg	19200	<13 8	3 9 (J)	107	0 86 (B)	1 4 (B)	15700	32 3	11 9 (B)	26	29200	61 2
(SED-DUP)	11/29/95	51101332	Not Applicable	mg/kg	21800	<13 9	6 2 (J)	117	1 0 (B)	1 5 (B)	14800	35	12 1 (B)	26 8	31600	65
	3/19/96	60300665	Not Applicable	mg/kg	16500	<12 7	5 8	210 (J)	0 93 (BJ)	<1 4	14600	29 8	12 5 (B)	25 7	29500	43 2
(SED-DUP)	3/19/96	60300670	Not Applicable	mg/kg	14400	<11 7	5 3	104 (J)	0 83 (BJ)	<1 2	11500 (J)	24 9	11 3 (B)	22 3	24000	46 8
	11/21/96	61100750	Not Applicable	mg/kg	13500	<9 6	3 6 (J)	84 1 (E)	0 69 (BJ)	<1 2 (N)	14300	25 3	10 8 (BJ)	23	21900	45 4
(SED-DUP)	11/21/96	61100751	Not Applicable	mg/kg	13800	<9 6	4 5 (SJ)	84 6 (E)	0 71 (BJ)	<1 2 (N)	15800	25 9	9 8 (BJ)	22 1	21200	48 8
	8/19/97	5660902	Not Applicable	mg/kg	7900 (J)	<7 5 (JN)	4 1 (JN)	79 4	<0 41	<1 6	13100 (J)	18 5 (J)	10 (BJ)	21 6 (J)	21900 (J)	55 (JS)
(SED DUP)	8/19/97	5660903	Not Applicable	mg/kg	5680 (J)	<6 5 (JN)	3 6 (JN)	66	<0 35	<1 4	9890 (J)	12 9 (J)	7 4 (BJ)	13 5 (J)	17100 (J)	29 2 (JS)
	2/12/98	5911502	Not Applicable	mg/kg	8220 (J)	<5 8 (JN)	8 5 (J+*)	80 3	<0 25	<1 2	20000 (J)	18 6	8 8 (BJ)	23 7	18500	59 5 (J)
(SED-DUP)	2/12/98	5911503	Not Applicable	mg/kg	9380 (J)	<5 7 (JN)	4 7 (J*)	82 7	<0 24	<1 2	19600 (J)	22 7	8 8 (BJ)	27 2	20000	60 2 (J)
	11/30/98	H8L030228-002	Not Applicable	mg/kg	6720	<18 6 (J)	4 9	76 4	0 49 (BJ)	<1 5	10200	16 6	13 1 (BJ)	16 9	21400	30 8
(SED-DUP)	11/30/98	H8L030228-003	Not Applicable	mg/kg	6660	<19 1 (J)	4 7	78 2	0 46 (BJ)	<1 6	11100	16 9	12 3 (BJ)	17 9	19500	32 8
	5/10/99	H9E120206-008	Not Applicable	mg/kg	12500	<28 3	6 1	98 4	0 77 (BJ)	<2 4	25800	29 1	12 4 (BJ)	37 5 (J)	23000	68 4
(SED-DUP)	5/10/99	H9E120206-007	Not Applicable	mg/kg	9960	<28 8	6 1	89 4 (BJ)	0 66 (BJ)	<2 4	24900	24 7	10 8 (BJ)	34 8 (J)	21400	61 4
	11/16/99	H9K180309-005	Not Applicable	mg/kg	8050 (J)	<20 3 (J)	7 5	78 5	0 75 (BJ)	<1 7	11300 (J)	15 5	8 6 (BJ)	13 3	22300 (J)	31 8
	5/24/00	HOE300151 027	Not Applicable	mg/kg	8980 (J)	<24 4	3 9 (BJ)	72 1 (BJ)	0 57 (BJ)	0 85 (BJ)	18600	21 4 (J)	8 0 (BJ)	30 5	17300 (J)	53 9 (J)
1988 NR 140 Ground Water Quality Standards	PAL	Not Applicable	ug/l	-	--	5	200	--	1	--	5	--	500	150	5
	ES	Not Applicable	ug/l	--	--	50	1000	--	10	--	50	--	1000	300	50
2001 NR 140 Ground Water Quality Standards	PAL	Not Applicable	ug/l	--	1 2	5	400	0 4	0 5	--	10	8	130	150	1 5
	ES	Not Applicable	ug/l	--	6 0	50	2000	4 0	5 0	--	100	40	1300	300	15

= Exceeds the PAL (Preventive Action Limit) for **1988**

= Exceeds the ES (Enforcement Standard) for **1988**

197 = Exceeds the PAL (Preventive Action Limit) for **2001**

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B- The value listed was detected between the reporting limit and the limit of detection

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J The value listed is estimated due to minor quality control deviations

Filtering was completed with disposable 0 45 micron filters

METALS (continued)

(Magnesium through Cyanide)

Sample Location	Sample Date	Sample Number	Filtered versus Unfiltered	Units	Magnesuim	Manganese	Mercury	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc	Cyanide
MW-6COR	11/27/95	51101336	unfiltered	ug/l	89000	80 2	<0 20	<9 1	2940	<2 0 (J)	<5 1	11900	<2 0	<3 4	14 6 (B)	3 1 (J)
	3/19/96	60300673	unfiltered	ug/l	93500	15 3	0 13 (BU)	<8 2	3170	<2 0	<5 4	10600	<2 0 (J)	<3 9	7 1 (B)	<2 5
	3/19/96	60300673	filtered	ug/l	91900	3 7 (BJ)		<8 2	3020		<5 4	10700		<3 9	12 0 (B)	
	8/15/96	60800363	filtered	ug/l	96100	19 3	0 06 (BU)	<10 5	2710	<2 0 (S)	<6 1	10300	<2 0	<2 9	<1 5	<2 5
	11/19/96	61100723	filtered	ug/l	100000	9 8 (BJ)	0 07 (BUJ)	<9 0	3520	2 1 (BJS)	<4 8 (NR)	10300	<2 0	1 9 (BUJ)	<1 7	<2 5
	8/20/97	H7H220192-003	filtered	ug/l	94900	23 8	<0 20	<20	2680 (U)	<3 0	<10	11000	4 3 (BUJ)	0 66 (BUJ)	76 1	<10
	11/18/97	H7K190164-003	filtered	ug/l	108000	5 0 (BJ)	<0 20 (J)	<20	2890	<3 0	<10	12300	4 2 (BJU)	0 94 (BJ)	8 4 (U)	<10
	2/10/98	H8B120173-003	filtered	ug/l	105000 (J)	4 7 (BJ)	0 034 (BU)	2 3 (BU)	3010	<5 0	<10	11300	3 0 (BU)	<10	24 6	<10
	5/11/98	H8E150200-003	filtered	ug/l	91300	333 3 (J)	<0 20	4 4 (BJU)	2550	<5 0	<10	9960 (J)	<10	<10	74 6 (J)	
	12/2/98	H8L030228-026	filtered	ug/l	97600	98 8	<0 20	1 2 (BJ)	2840	<5 0	<10	11400	<10	1 3 (BUJ)	28 8 (J)	<10
	5/11/99	H9E120206-17	filtered	ug/l	87200	234	0 074 (BUJ)	<20	2710	<5 0	<10	9630	<10	<10	17 4 (BUJ)	<10
	11/16/99	H9K180309-023	filtered	ug/l	81200 (J)	254	<0 20	<20	2240	<5 0	<10	9210 (J)	<10	<10	1 7 (BUJ)	<10
	5/23/00	H0E300151-006	filtered	ug/l	88600 (J)	265 (J)	<0 20	<20	2200 (J)	<5 0	<10	9870 (J)	2 8 (BUJ)	0 71 (BUJ)	8 5 (BJ)	<10
	11/8/00	H0K100218-007	filtered	ug/l	85200	402	<0 20	<20	1960 (J)	<5 0	<10	10000	3 8 (BJU)	<10	4 7 (BJU)	<10
	5/8/01	H1E100217-009	filtered	ug/l	88600	358 (J)	0 050 (B)	<20	1890	<5 0	<10	10600	<10	<10	15 7 (BJ)	<10
MW 6S	11/28/95	51101334	unfiltered	ug/l	71700	270	<0 20	<9 1	1710	<2 0 (J)	<5 1	17800	<2 0	<3 4	12 7 (B)	4 0 (J)
	3/19/96	60300671	unfiltered	ug/l	67700	259	0 06 (BU)	<8 2	1480	2 4 (B)	<5 4	17700	<2 0	<3 9	31 7	<2 5
	3/19/96	60300671	filtered	ug/l	681000	259 (J)		<8 2	1970		<5 4	18000		<3 9	9 1 (B)	
	8/15/96	60800359	filtered	ug/l	68900	248	0 12 (BU)	<10 5	1340	2 8 (BS)	<6 1	18800	<2 0	<2 9	<1 5	<2 5
	11/19/96	61100725	filtered	ug/l	72100	210	0 07 (BUJ)	<9 0	2550	<2 0	<4 8 (NR)	19400	<2 0	<1 8	<1 7	<2 5
	8/20/97	H7H220192-001	filtered	ug/l	69800	183	<0 20	<20	1690 (U)	<3 0	<10	22000	9 6(BUJ)	<10	8 5 (UJ)	<10
(MW DUP)	8/20/97	H7H220192-006	filtered	ug/l	64700	178	<0 20	<20	1640 (U)	<3 0	<10	20200	4 1 (BUJ)	<10	32 6 (J)	<10
	11/18/97	H7K190164-001	filtered	ug/l	69400	154	0 21 (J)	<20	1690	<3 0	<10	23400	6 8 (BJU)	<10	12 7 (U)	<10
	2/10/98	H8B120173-001	filtered	ug/l	72300 (J)	148	0 037 (BU)	<20	1640	<5 0	<10	23300	<10	<10	5 8 (U)	<10
	5/11/98	H8E150200-001	filtered	ug/l	66900	156 (J)	<0 20	2 1 (BJU)	2020	<5 0	<10	23800	<10	<10	34 1 (J)	
	12/2/98	H8L030228-026	filtered	ug/l	69300	143	0 016 (BUJ)	<20	1440	<5 0	<10	25400 (J)	<10	0 54 (BUJ)	56 6 (J)	<10
	5/11/99	H9E120206-014	filtered	ug/l	61200	124	<0 20	<20	1570	<5 0	<10	21600	<10	<10	6 1 (BUJ)	<10
(MW-DUP)	5/11/99	H9E120206-021	filtered	ug/l	61200	129	0 073 (BUJ)	<20	1660	<5 0	<10	21700	<10	<10	10 7 (BUJ)	<10
	11/16/99	H9K180309-013	filtered	ug/l	59400	119	<0 20	<20	1420 (BUJ)	<5 0	<10	21500 (J)	7 4 (BJ)	<10	1 9 (BJ)	<10
	5/23/00	H0E300151-004	filtered	ug/l	63200 (J)	104 (J)	<0 20	<20	1340 (BJ)	<5 0	<10	23100 (J)	3 7 (BUJ)	<10	7 0 (BJ)	<10
	11/8/00	H0K100218-005	filtered	ug/l	61100	113	<0 20	<20	1270 (BJ)	<5 0	<10	24200	5 3 (BJU)	<10	1 6 (BJU)	<10
	5/8/01	H1E100217 007	filtered	ug/l	60900	107 (J)	<0 20	<20	1170 (BJ)	<5 0	<10	24700	<10	<10	6 9 (BJ)	<10
1988 NR 140 Ground Water Quality Standards	PAL	Not Applicable		ug/l	--	25	0 2	--	--	1	10	--	--	--	2500	40
	ES	Not Applicable		ug/l	--	50	2	--	--	10	50	--	--	--	5000	200
2001 NR 140 Ground Water Quality Standards	PAL	Not Applicable		ug/l	--	25	0 2	20	--	10	10	--	0 4	6	2500	40
	ES	Not Applicable		ug/l	--	50	2	100	--	50	50	--	2	30	5000	200

= Exceeds the PAL (Preventive Action Limit) for **1988**

= Exceeds the ES (Enforcement Standard) for **1988**

197 = Exceeds the PAL (Preventive Action Limit) for **2001**

338 = Exceeds the ES (Enforcement Standard) for **2001**

B The value listed was detected between the reporting limit and the limit of detection

U Data validation indicates this value is not a qualified detect and is interpreted as no detect

J- The value listed is estimated due to minor quality control deviations

Filtering was completed with disposable 0 45 micron filters

METALS (continued)

(Magnesium through Cyanide)

Sample Location	Sample Date	Sample Number	Filtered versus Unfiltered	Units	Magnesuim	Manganese	Mercury	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc	Cyanide
MW-6D	11/28/95	51101333	unfiltered	ug/l	43500	32 3	<0 20	<9 1	2270	<2 0 (J)	<5 1	29900	<2 0	<3 4	12 5 (B)	3 4 (J)
	3/19/96	60300672	unfiltered	ug/l	41800	26 2	0 10 (BU)	<8 2	1170	2 1 (B)	<5 4	28800	<2 0 (J)	<3 9	4 7 (B)	<2 5
	3/19/96	60300672	filtered	ug/l	41200	25 3 (J)		<8 2	1480		<5 4	28400		<3 9	5 5 (B)	
	8/16/96	60800445	filtered	ug/l	43700	25 8	0 08 (BU)	<10 5	1380	<2 0 (S)	<6 1	28900	<2 0	<2 9	<1 5	<2 5
(MW DUP)	8/16/96	60800449	filtered	ug/l	43700	26 1	0 08 (BU)	<10 5	1640	<2 0 (S)	<6 1	28500	<2 0	<2 9	<1 5	<2 5
	11/19/96	61100724	filtered	ug/l	45500	31 1	0 12 (BUJ)	<9 0	2240	<2 0 (S)	<4 8 (NR)	29300	<2 0	<1 8	<1 7	10 9
	8/20/97	H7H220192-002	filtered	ug/l	43600	24 6	<0 20	<20	1490 (U)	<3 0	<10	30600	6 2 (BUJ)	<10	23 3	<10
	11/18/97	H7K190184-002	filtered	ug/l	46500	23 4	<0 20 (J)	<20	1900	<3 0	<10	32400	4 8 (BJU)	<10	6 4 (U)	<10
	2/10/98	H8B120173-002	filtered	ug/l	45200 (J)	19 8	0 036 (BU)	<20	1770	<5 0	<10	31800	<10	<10	10 5 (U)	<10
	5/13/98	H8E150200-002	filtered	ug/l	43800	17 5 (J)	<0 20	<20	1670	<5 0	<10	31100 (J)	<10	<10	28 1 (J)	
	12/1/98	H8L030228-027	filtered	ug/l	43200	19 5 (J)	0 026 (BUJ)	<20	1740	<5 0	<10	32300	4 1 (BJ)	<10	8 2 (UJ)	<10
	5/11/99	H9E120206-019	filtered	ug/l	39800	21 1	0 067 (BUJ)	<20	1890	<5 0	<10	28900	<10	<10	8 9 (BUJ)	<10
	11/16/99	H9K180309-024	filtered	ug/l	37300 (J)	12 2	<0 20	<20	1550	<5 0	<10	28600 (J)	<10	<10	2 8 (BUJ	<10
	5/24/00	HOE300151 008	filtered	ug/l	39400 (J)	21 7 (J)	<0 20	<20	1470 (BJ)	<5 0	<10	30700 (J)	3 5 (BUJ)	<10	3 1 (BUJ)	<10
	11/9/00	HOK100218-009	filtered	ug/l	39100	20	<0 20	<20	1430 (BJ)	<5 0	<10	31200	<10	<10	1 8 (BJU)	<10
	5/8/01	H1E100217-005	filtered	ug/l	38800	26 1 (J)	<0 20	<20	1330 (BJ)	<5 0	<10	32000	5 8 (BUJ)	<10	4 7 (BJ)	<10
MW-7CO	11/27/95	51200055	unfiltered	ug/l	109000	43 8	<0 20	<9 1	3130	<2 0 (J)	<5 1	58600	<2 0	<3 4	11 4 (B)	6 2 (J)
	3/18/96	60300610	unfiltered	ug/l	104000	9 9 (B)	0 22 (U)	<8 2	2570	<2 0	<5 4	47600	<2 0	<3 9	32 8	<2 5
	3/18/96	60300610	filtered	ug/l	101000	7 4 (BJ)		<8 2	2280		<5 4	47600		<3 9	21 3	
	8/15/96	60800364	filtered	ug/l	107000	27 9	0 06 (BU)	<10 5	3010	2 1 (BS)	<6 1	47200	<2 0	<2 9	<1 5	<2 5
	11/20/96	61100726	filtered	ug/l	112000	4 3 (BJ)	0 06 (BUJ)	<9 0	4020	<2 0	<4 8 (NR)	50200	<2 0	1 9 (BUJ)	5 3 (BJ)	<2 5
	8/22/97	H7H260142 001	filtered	ug/l	110000	21 6	<0 20	1 9 (BUJ)	3700	<3 0	<10	56700	<10	<10	63 4	<10
	11/17/97	H7K190184-008	filtered	ug/l	118000	1 8 (BJU)	0 31 (J)	7 6 (BJU)	4020	<3 0	<10	65200	3 7 (BJU)	<10	50 7	<10 (J)
	2/10/98	H8B120173-005	filtered	ug/l	119000 (J)	2 6 (BJ)	0 034 (BU)	3 4 (BU)	3520	<5 0	1 2 (BU)	62600	<10	<10	4 8 (BU)	<10
	5/11/98	H8E150200-008	filtered	ug/l	112000	4 1 (BJ)	<0 20	2 8 (BJU)	3190	<5 0	<10	59600 (J)	<10	<10	68 1 (J)	
	12/3/98	H8L040143-005	filtered	ug/l	115000	1 7 (BUJ)	0 014 (BUJ)	1 5 (BJ)	3330	<5 0	<10	63700	5 3 (BJ)	0 78 (BJU)	20 4 (U)	<10
	5/12/99	H9E130212-002	filtered	ug/l	118000	2 3 (BUJ)	0 083 (BUJ)	2 5 (B)	3470	<5 0	<10	59400	<10	<10	69 6	<10
	11/17/99	H9K180309-026	filtered	ug/l	104000 (J)	2 8 (BJ)	<0 20	1 8 (BUJ)	3270	<5 0	<10	56700 (J)	<10	0 65 (BUJ)	4 0 (BUJ)	<10
	5/23/00	HOE300151-012	filtered	ug/l	118000 (J)	1 5 (BUJ)	<0 20	1 8 (BJ)	2640 (J)	<5 0	<10	60500 (J)	<10	<10	9 0 (BJ)	<10
(MW DUP)	5/23/00	HOE300151 022	filtered	ug/l	116000 (J)	1 6 (BUJ)	<0 20	2 3 (BJ)	2660 (J)	3 2 (BJ)	<10	58900 (J)	<10	<10	9 3 (BJ)	<10
	11/8/00	HOK100218-014	filtered	ug/l	120000	10 8	<0 20	<20 0	3110 (J)	<5 0	<10	63800	<10	<10	3 7 (BJU)	<10
(MW DUP)	11/8/00	HOK100218-024	filtered	ug/l	120000	10 2	<0 20	1 9 (BJ)	3110 (J)	<5 0	<10	64500	<10	<10	6 9 (BJ)	<10
	5/8/01	H1E100217 024	filtered	ug/l	127000	8 0 (BUJ)	<0 20	<20 0	2420	<5 0	<10	67200	<10	<10	12 1 (BJ)	<10
1988 NR 140 Ground Water Quality Standards		PAL	Not Applicable	ug/l	--	25	0 2	--	--	1	10	--	--	--	2500	40
		ES	Not Applicable	ug/l	--	50	2	--	--	10	50	--	--	--	5000	200
2001 NR 140 Ground Water Quality Standards		PAL	Not Applicable	ug/l	--	25	0 2	20	--	10	10	--	0 4	6	2500	40
		ES	Not Applicable	ug/l	--	50	2	100	--	50	50	--	2	30	5000	200

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197 = Exceeds the PAL (Preventive Action Limit) for **2001**

338 = Exceeds the ES (Enforcement Standard) for **2001**

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J- The value listed is estimated due to minor quality control deviations

Filtering was completed with disposable 0 45 micron filters

METALS (continued)

(Magnesium through Cyanide)

Sample Location	Sample Date	Sample Number	Filtered versus Unfiltered	Units	Magnesuim	Manganese	Mercury	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc	Cyanide
MW-7S	11/30/95	51200058	unfiltered	ug/l	22200	69 9	<0 20	9 2 (B)	3110	<2 0	<5 1	51700	<2 0	4 4 (B)	26 2	11 4 (J)
	3/18/96	60300611	unfiltered	ug/l	26200	17 4	0 06 (BU)	<8 2	1690	<2 0	<5 4	44300	<2 0	<3 9	26 7	<2 5
	3/18/96	60300611	filtered	ug/l	24800	1 6 (BJ)		<8 2	1560		<5 4	43900		<3 9	13 8 (B)	
	8/15/96	60800365	filtered	ug/l	26000	6 6 (B)	0 10 (BU)	<10 5	1860	<2 0 (S)	<6 1	42500	<2 0	<2 9	<1 5	<2 5
	11/20/96	61100730	filtered	ug/l	27500	6 4 (BJ)	0 10 (BUJ)	<9 0	2460	<2 0	<4 8 (NR)	44600	<2 0	1 8 (BUJ)	4 4 (BJ)	<2 5
	8/21/97	H7H230120-003	filtered	ug/l	27000	23 7	<0 20	<20	1620 (U)	<3 0	<10	45800	4 3 (BUJ)	1 4 (BUJ)	13 2 (UJ)	<10
	11/17/97	H7K190164 009	filtered	ug/l	27700	23	4 1 (J)	<20	2270	<3 0	<10	48400	6 8 (BJU)	1 3 (BJ)	22 6	<10 (J)
	2/10/98	H8B120173-006	filtered	ug/l	29800 (J)	15 9	0 032 (BU)	<20	1850	<5 0	<10	47600	<10	1 2 (BJ)	5 5 (U)	<10
(MW DUP)	2/10/98	H8B120173-007	filtered	ug/l	32300 (J)	19 1	0 032 (BU)	<20	2160	<5 0	<10	51100	3 2 (BU)	1 4 (BJ)	7 9 (U)	<10
	5/11/98	H8E150200-009	filtered	ug/l	28900	12 3 (J)	<0 20	3 1 (BJU)	1950	<5 0	<10	44200 (J)	<10	0 94 (BJ)	20 3 (J)	
	12/1/98	H8L030228-032	filtered	ug/l	25500	58 1	0 019 (BUJ)	<20	2640	<5 0	<10	46600	5 0 (BJ)	1 1 (BUJ)	15 1 (UJ)	<10
	5/11/99	H9E120206-023	filtered	ug/l	27000	12 8	0 061 (BUJ)	<20	1920	<5 0	<10	41000	<10	<10	29 4 (UJ)	<10
	11/17/99	H9K180309-025	filtered	ug/l	26700 (J)	6 9 (BJ)	<0 20	<20	1760	<5 0	<10	42900 (J)	<10	2 7 (BUJ)	2 5 (BUJ)	<10
	5/23/00	HOE300151 010	filtered	ug/l	27300 (J)	11 6 (J)	<0 20	49 3	1480 (BJ)	<5 0	<10	42300 (J)	<10	1 4 (BUJ)	2 0 (BUJ)	<10
	11/9/00	HOK100218-012	filtered	ug/l	26400	24 7	<0 20	<20	1500 (J)	<5 0	<10	41300	3 7 (BJU)	<10	9 0 (BJ)	<10
	5/8/01	H1E100217 022	filtered	ug/l	26700	19 0 (J)	<0 20	<20	1240 (BJ)	<5 0	<10	43800	2 7 (BJU)	<10	6 9 (BJ)	<10
MW-8CO	11/30/95	51200059	unfiltered	ug/l	620000	806	<0 20	9 8 (B)	12600	<2 0 (J)	<5 1	98900	<2 0	<3 4	7 8 (B)	<2 5 (J)
	3/18/96	60300608	unfiltered	ug/l	616000	699	0 07 (BU)	9 9 (B)	11700	<2 0	<5 4	97800	<2 0	<3 9	12 0 (B)	<2 5
	3/18/96	60300608	filtered	ug/l	557000	629 (J)		<8 2	10300		<5 4	86900		<3 9	2 4 (B)	
	8/15/96	60800366	filtered	ug/l	581000	417	0 08 (BU)	<10 5	10600	3 0 (S)	<6 1	97100	<2 0	<2 9	1 5 (B)	<2 5
	11/20/96	61100731	filtered	ug/l	620000	486	0 11 (BUJ)	<9 0	12400	<10 0	<4 8 (NR)	93100	<2 0	<1 8	21 1	4 2 (J)
	8/21/97	H7H230120-001	filtered	ug/l	582000	351	<0 20	11 6 (BUJ)	12200	<3 0	<10	103000	5 3 (BUJ)	<10	68 1	<10
	11/17/97	H7K190164 006	filtered	ug/l	598000	464	0 22 (J)	10 4 (BJU)	13100	<3 0	1 2 (BJU)	113000	3 0 (BJU)	<10	8 6 (U)	<10 (J)
	2/10/98	H8B120173 004	filtered	ug/l	584000 (J)	353	0 032 (BU)	10 8 (BJ)	12500	<5 0	<10	106000	<10	<10	10 4 (U)	<10
	5/11/98	H8E150200-006	filtered	ug/l	548000	168 (J)	<0 20	15 2 (BJ)	12100	<5 0	<10	107000	<10	<10	37 3 (J)	
	12/3/98	H8L040143 004	filtered	ug/l	393000	265	0 017 (BUJ)	7 2 (BJ)	10300	<5 0	<10	102000	4 3 (BJ)	<10	59 2 (J)	<10 (J)
	5/12/99	H9E130212-004	filtered	ug/l	228000	423	0 16 (BUJ)	3 7 (BJ)	6160	<5 0	<10	101000	<10	<10	61 7	<10
	11/16/99	H9K180309-027	filtered	ug/l	312000 (J)	270	<0 20	5 3 (BUJ)	9690	<5 0	<10	111000 (J)	<10	<10	<20 0	<10
(MW DUP)	11/16/99	H9K180309-031	filtered	ug/l	313000 (J)	305	<0 20	6 2 (BUJ)	9680	<5 0	<10	109000 (J)	<10	<10	0 65 (BUJ)	<10
	5/23/00	HOE300151 014	filtered	ug/l	136000 (J)	6 2 (BJ)	<0 20	2 2 (BJ)	6710 (J)	<5 0	<10	118000 (J)	2 7 (BUJ)	<10	7 6 (BJ)	<10
	11/8/00	HOK100218-016	filtered	ug/l	211000	9 1 (BJ)	<0 20	2 6 (BJ)	8370 (J)	<5 0	<10	120000	5 2 (BJU)	<10	50 4	<10
	5/8/01	H1E100217 018	filtered	ug/l	222000	13 8 (UJ)	<0 20	1 6 (BJ)	7650	<5 0	<10	168000	<10	<10	8 9 (BJ)	<10
(MW DUP)	5/8/01	H1E100217-020	filtered	ug/l	270000	122 (J)	<0 20	2 8 (BJ)	8230	<5 0	<10	139000	<10	<10	10 5 (BJ)	<10
1988 NR 140 Ground Water Quality Standards		PAL	Not Applicable	ug/l	--	25	0 2	--	--	1	10	--	--	--	2500	40
		ES	Not Applicable	ug/l	--	50	2	--	--	10	50	--	--	--	5000	200
2001 NR 140 Ground Water Quality Standards		PAL	Not Applicable	ug/l	--	25	0 2	20	--	10	10	--	0 4	6	2500	40
		ES	Not Applicable	ug/l	--	50	2	100	--	50	50	--	2	30	5000	200

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METALS (continued)

(Magnesium through Cyanide)

Sample Location	Sample Date	Sample Number	Filtered versus Unfiltered	Units	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc	Cyanide
MW 8D	11/29/95	51200056	unfiltered	ug/l	39700	132	<0 20	11 7 (B)	2210	<2 0 (J)	<5 1	38300	<2 0	3 (B)	33 2	<2 5 (J)
(MW DUP)	11/29/95	51200057	unfiltered	ug/l	38500	123	<0 20	11 7 (B)	1930	<2 0 (J)	<5 1	36900	<2 0	6 0 (B)	29 4	<2 5 (J)
	3/18/96	60300609	unfiltered	ug/l	40600	106	0 48 (J)	8 7 (B)	2700	<2 0	<5 4	37100	<2 0	5 7 (B)	30 3	<2 5
	3/18/96	60300609	filtered	ug/l	32300	33 1 (J)		<8 2	1320		<5 4	36600		<3 9	9 2 (B)	
	8/16/96	60800448	filtered	ug/l	34100	48 1	0 06 (BU)	<10 5	1430	<2 0 (S)	<6 1	35000	<2 0	<2 9	<1 5	<2 5
	11/20/96	61100732	filtered	ug/l	33100	49 5	0 10 (BUJ)	<9 0	1930	<2 0	<4 8 (NR)	32700	<2 0	<1 8	5 0 (BJ)	<2 5 (J)
(MW DUP)	11/20/96	61100735	filtered	ug/l	33700	50	0 33 (J)	<9 0	1820	<2 0	<4 8 (NR)	33500	<2 0	<1 8	2 1 (BJ)	11 5 (J)
	8/21/97	H7H230120-002	filtered	ug/l	35000	50 6	<0 20	<20	1990	<3 0	<10	35800	<10	<10	29	<10
	11/17/97	H7K190164 007	filtered	ug/l	36400	41	0 25 (J)	<20	1900	<3 0	<10	42500	4 0 (BJU)	<10	7 8 (U)	<10
	2/11/98	H8B120173-010	filtered	ug/l	36600 (J)	48 7	0 036 (BU)	<20	2010	<5 0	<10	40200	3 6 (BU)	<10	6 1 (U)	<10
	5/11/98	H8E150200-007	filtered	ug/l	33900	44 2 (J)	<0 20	2 3 (BJU)	2030	<5 0	<10	37900 (J)	<10	<10	45 8 (J)	
(MW DUP)	5/11/98	H8E150200-010	filtered	ug/l	29600	11 7 (J)	<0 20	1 1 (BJU)	1390	<5 0	<10	48500	<10	<10	26 9 (J)	
	12/1/98	H8L030228-031	filtered	ug/l	34200	43 6 (J)	0 020 (BUJ)	<20	1970	<5 0	4 4 (BJ)	37800	5 2 (BJ)	0 54 (BUJ)	13 (UJ)	<10
	5/11/99	H9E120206-025	filtered	ug/l	32100	30 3	0 079 (BUJ)	<20	1900	<5 0	<10	34200	<10	<10	9 2 (BJU)	<10
	11/16/99	H9K180309-038	filtered	ug/l	30700 (J)	31 1	<0 20	<20	1740 (J)	<5 0	<10	35200 (J)	<10	<10	5 6 (BUJ)	<10
	5/23/00	HOE300151 016	filtered	ug/l	33200 (J)	31 2 (J)	<0 20	<20	1620 (J)	<5 0	<10	36400 (J)	3 8 (BUJ)	<10	3 6 (BUJ)	<10
	11/8/00	HOK100218-018	filtered	ug/l	32400	35 4	<0 20	<20	1500 (J)	<5 0	<10	35500	<10	<10	14 5 (BJ)	<10
	5/8/01	H1E100217 015	filtered	ug/l	32600	34 6 (J)	<0 20	<20	1400 (BJ)	<5 0	<10	36400	<10	<10	4 6 (BJ)	<10
MW 9S	11/29/95	51200054	unfiltered	ug/l	20600	158	<0 20	16 4 (B)	3530	<2 0 (J)	<5 1	53000	<2 0	12 8	39 1	8 7 (J)
	3/18/96	60300606	unfiltered	ug/l	13200	89 2	0 22 (UJ)	<8 2	2060	<2 0	<5 4	50900	<2 0	<3 9	15 1 (BJ)	<2 5
(MW DUP)	3/18/96	60300612	unfiltered	ug/l	13900	74 1	0 64 (J)	<8 2	1850	<2 0	<5 4	54000	<2 0	4 3 (B)	12 2 (BJ)	<2 5
	3/18/96	60300606	filtered	ug/l	12500	52 7 (J)		<8 2	1590		<5 4	53300		<3 9	3 4 (B)	
(MW DUP)	3/18/96	60300612	filtered	ug/l	12300	51 8 (J)		<8 2	1450		<5 4	52700		<3 9	4 4 (B)	
	8/16/96	60800446	filtered	ug/l	12600	50 9	0 14 (BU)	<10 5	1370	<2 0 (S)	<6 1	53000	<2 0	<2 9	<1 5	<2 5
	11/19/96	61100734	filtered	ug/l	11600	46 8	0 11 (BUJ)	<9 0	2040	<2 0	<4 8 (NR)	50300	<2 0	<1 8	<1 7	<2 5
	8/20/97	H7H220192-004	filtered	ug/l	12400	47	<0 20	<20	992 (U)	<3 0	<10	58400	3 3 (BUJ)	0 84 (BUJ)	7 1	<10
	11/17/97	H7K190164 004	filtered	ug/l	12900	42 5	<0 20 (J)	<20	1560	<3 0	<10	61100	4 5 (BJU)	<10	8 4 (U)	<10
	11/17/97	H7K190164-010	filtered	ug/l	12800	43 4	0 49 (J)	<20	1560	<3 0	0 97 (BJU)	61300	5 8 (BJU)	0 85 (BJ)	6 1 (U)	<10
	2/11/98	H8B120173-008	filtered	ug/l	14000 (J)	45 5	0 032 (BU)	<20	1760	<5 0	<10	63400	<10	<10	6 0 (U)	<10
	5/11/98	H8E150200-004	filtered	ug/l	12800	43 1 (J)	<0 20	1 4 (BJU)	1460	<5 0	<10	60000	<10	<10	47 4 (J)	
	12/1/98	H8L030228-029	filtered	ug/l	13900	43 1 (J)	0 015 (BUJ)	<20	1280	<5 0	<10	60600	5 1 (BJ)	0 75 (BUJ)	7 7 (UJ)	<10
(MW DUP)	12/1/98	H8L030228-033	filtered	ug/l	13200	41 9	0 016 (BUJ)	<20	1220	<5 0	<10	58200	<10	0 54 (BUJ)	7 5 (UJ)	<10
	5/11/99	H9E120206-027	filtered	ug/l	12100	37 9	0 094 (BUJ)	<20	1210 (B)	<5 0	<10	52500	<10	<10	13 9 (BUJ)	<10
	11/16/99	H9K180309-029	filtered	ug/l	11900 (J)	35 9	<0 20	<20	1020 (BJ)	<5 0	<10	52500 (J)	<10	1 7 (BUJ)	13 9 (BUJ)	<10
	5/23/00	HOE300151-016	filtered	ug/l	13400 (J)	40 3 (J)	<0 20	<20	915 (BJ)	<5 0	<10	54600 (J)	3 8 (BUJ)	1 0 (BUJ)	1 1 (BUJ)	<10
	11/8/00	HOK100218-020	filtered	ug/l	13400	40 8	<0 20	<20	884 (BJ)	<5 0	<10	55100	4 6 (BJU)	0 85 (BJ)	3 9 (BJU)	<10
	5/8/01	H1E100217-011	filtered	ug/l	13300	39 4 (J)	<0 20	<20	786 (BJ)	<5 0	<10	54000	2 7 (BJU)	0 79 (BJ)	<20	<10
1988 NR 140 Ground Water Quality Standards	PAL	Not Applicable		ug/l	--	25	0 2	--	--	-- 1	10	--	--	--	2500	40
	ES	Not Applicable		ug/l	--	50	2	--	--	10	50	--	--	--	5000	200
2001 NR 140 Ground Water Quality Standards	PAL	Not Applicable		ug/l	--	25	0 2	20	--	10	10	--	0 4	6	2500	40
	ES	Not Applicable		ug/l	--	50	2	100	--	50	50	--	2	30	5000	200

= Exceeds the PAL (Preventive Action Limit) for **1988**

= Exceeds the ES (Enforcement Standard) for **1988**

197 = Exceeds the PAL (Preventive Action Limit) for **2001**

338 = Exceeds the ES (Enforcement Standard) for **2001**

B The value listed was detected between the reporting limit and the limit of detection

U- Data validation indicates this value is not a qualified detect and is interpreted as no detect

J- The value listed is estimated due to minor quality control deviations

Filtering was completed with disposable 0 45 micron filters

METALS (continued)

(Magnesium through Cyanide)

Sample Location	Sample Date	Sample Number	Filtered versus Unfiltered	Units	Magnesuim	Manganese	Mercury	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc	Cyanide
MW-9D	11/28/95	51101335	unfiltered	ug/l	27300	36 9	<0 20	<9 1	966	<2 0 (J)	<5 1	40000	<2 0	<3 4	10 9 (B)	3 1 (J)
	3/18/96	60300607	unfiltered	ug/l	26500	55 1	0 25 (U)	<8 2	1390	<2 0	<5 4	38600	<2 0	<3 9	9 7 (B)	<2 5
	3/18/96	60300607	filtered	ug/l	25800	29 1 (J)		<8 2	1270		<5 4	39400		<3 9	12 1 (B)	
	8/16/96	60800447	filtered	ug/l	26100	45 4	0 05 (BU)	<10 5	<989	<2 0 (S)	<6 1	38800	<2 0	<2 9	3 7 (B)	<2 5
	11/19/96	61100733	filtered	ug/l	25500	28 3	0 11 (BUJ)	<9 0	1600	<2 0	<4 8 (NR)	36700	<2 0	<1 8	<1 7	<2 5
	8/20/97	H7H220192-005	filtered	ug/l	26400	46 9	<0 20	<20	1460 (U)	<3 0	<10	43500	4 0 (BUJ)	<10	9 3	<10
	11/17/97	H7K190164 005	filtered	ug/l	28700	21	0 20 (J)	<20	1890	<3 0	<10	46800	4 6 (BJU)	<10	11 4 (U)	<10
	2/11/98	H8B120173 009	filtered	ug/l	27800 (J)	5 4 (BJ)	0 031 (BU)	<20	1590	<5 0	<10	45800	3 7 (BU)	<10	5 6 (U)	<10
	5/11/98	H8E150200-005	filtered	ug/l	27400	18 2 (J)	<0 20	3 7 (BJU)	1930	<5 0	<10	45300 (J)	<10	<10	18 1 (J)	
	12/1/98	H8L030228-030	filtered	ug/l	26100	8 9 (BJ)	0 015 (BUJ)	<20	1540	<5 0	<10	42700	<10	<10	15 3 (UJ)	<10
	5/11/99	H9E120206-029	filtered	ug/l	22800	22 9	0 069 (BUJ)	<20	1500	<5 0	<10	38200	<10	<10	10 8 (BUJ)	<10
	11/16/99	H9K180309-030	filtered	ug/l	21400 (J)	14 8	<0 20	<20	1340 (BUJ)	<5 0	<10	38500 (J)	<10	1 4 (BUJ)	45 3 (BUJ)	<10
	5/23/00	HOE300151 020	filtered	ug/l	22800 (J)	13 1 (J)	<0 20	<20	1280 (BJ)	<5 0	<10	39500 (J)	4 1 (BUJ)	<10	4 4 (BUJ)	<10
	11/8/00	HOK100218-022	filtered	ug/l	23300	5 4 (BJ)	<0 20	<20	1220 (BJ)	<5 0	<10	40400	4 0 (BJU)	<10	14 8 (BJ)	<10
	5/8/01	H1E100217-013	filtered	ug/l	23000	7 0 (BUJ)	<0 20	<20	1120 (BJ)	<5 0	<10	40900	3 9 (BJU)	<10	8 6 (BJ)	<10
PW-01	11/27/95	51101338	unfiltered	ug/l	30300	11 3	<0 20	<9 1	1210	<2 0 (J)	<5 1	45500	<2 0	<3 4	38 2 (J)	<2 5 (J)
(PW 01 DUP)	11/27/95	51101342	unfiltered	ug/l	29700	9 7 (B)	<0 20	9 2 (B)	<730	<2 0 (J)	<5 1	42500	<2 0	<3 4	24 (J)	5 2 (J)
	3/18/96	60300614	unfiltered	ug/l	30100	9 5 (B)	<0 03	<8 2	<958	<2 0	<5 4	44500	<2 0	<3 9	37	<2 5
(PW 01 DUP)	3/18/96	60300613	unfiltered	ug/l	29200	9 1 (B)	<0 03	<8 2	<958	<2 0	<5 4	42800	<2 0	<3 9	32 3	<2 5
	3/18/96	60300614	filtered	ug/l	29700	9 6 (BJ)		<8 2	<958		<5 4	43100		<3 9	29 8	
(PW 01 DUP)	3/18/96	60300613	filtered	ug/l	29700	9 5 (BJ)		<8 2	<958		<5 4	43100		<3 9	28 5	
	8/14/96	60800357	filtered	ug/l	30600	11 8	0 06 (BU)	<10 5	<989	<2 0 (S)	<6 1	43800	<2 0	<2 9	7 2 (B)	<2 5
(PW 01 DUP)	8/14/96	60800358	filtered	ug/l	30500	12	0 07 (BU)	<10 5	<989	2 3 (BS)	<6 1	43400	<2 0	<2 9	6 9 (B)	<2 5
	11/21/96	61100720	unfiltered	ug/l	31100	12 4	0 05 (BUJ)	<9 0	1920	<2 0 (S)	<4 8 (NR)	43700	<2 0	<1 8	10 7 (BJ)	<2 5
(PW-01 DUP)	11/21/96	61100721	unfiltered	ug/l	31000	12 3	0 07 (BUJ)	<9 0	1560	<2 0 (S)	<4 8 (NR)	43500	<2 0	<1 8	14 8 (BJ)	<2 5
	8/22/97	H7H260142 002	unfiltered	ug/l	28200	11 7	<0 20	<20	1050	<3 0	<5 0	50600	3 2 (BUJ)	<10	22 4	<10
	11/18/97	H7K190164-011	unfiltered	ug/l	30400	10 4	0 21	<20	1200	<3 0	<5 0	48700	4 3 (BJU)	<10	11 8 (U)	<10
	2/12/98	H8B130179-002	unfiltered	ug/l	30200	12 8	0 030 (BU)	<20	922 (BU)	<5 0	<5 0	49400	10 5 (U)	<10	38 6	<10
	5/12/98	H8E150200-011	unfiltered	ug/l	35000	47 2 (J)	<0 20	<20	1900	<5 0	<5 0	38700 (J)	<10	<10	41 2 (J)	
	12/1/98	H8L030228-020	unfiltered	ug/l	28800	10 8 (J)	0 022 (BUJ)	<20	1260	<5 0	<5 0	46700	4 2 (BJ)	<10	10 1 (UJ)	<10
	5/10/99	H9E120206-003	unfiltered	ug/l	26200	10 3	0 083 (BUJ)	<20	1210 (BJ)	<5 0	<5 0	42900	<10	<10	21 5 (UJ)	<10
1988 NR 140 Ground Water Quality Standards	PAL	Not Applicable	ug/l	--	25	0 2	--	--	1	10	--	--	--	2500	40
	ES	Not Applicable	ug/l	--	50	2	--	--	10	50	--	--	--	5000	200
2001 NR 140 Ground Water Quality Standards	PAL	Not Applicable	ug/l	--	25	0 2	20	--	10	10	--	0 4	6	2500	40
	ES	Not Applicable	ug/l	--	50	2	100	--	50	50	--	2	30	5000	200

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Filtering was completed with disposable 0 45 micron filters

METALS (continued)

(Magnesium through Cyanide)

Sample Location	Sample Date	Sample Number	Filtered versus Unfiltered	Units	Magnesuim	Manganese	Mercury	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc	Cyanide
LEACHATE	11/30/95	51200060	unfiltered	ug/l	122000	24 1	<0 20	<9 1	9270	<2 0 (J)	<5 1	53400	<2 0	<3 4	14 7 (B)	4 8 (J)
	3/19/96	60300675	unfiltered	ug/l	152000	52 3	0 07 (BU)	<8 2	9840	<2 0	5 4	70100	<2 0 (J)	<3 9	14 4 (B)	3 7
	3/19/96	60300675	filtered	ug/l	145000	33 1 (J)		<8 2	9650		<5 4	67100		<3 9	15 7 (B)	
	8/14/96	60800368	unfiltered	ug/l	183000	25 5	0 08 (BU)	<10 5	21700	2 1 (BS)	<6 1	90600	<2 0	<2 9	13 4 (B)	<2 5
	8/14/96	60800368	filtered	ug/l	178000	18 7	0 08 (BU)	<10 5	20600	2 9 (BS)	<6 1	89200	<2 0	<2 9	3 7 (B)	
	11/21/96	61100737	unfiltered	ug/l	163000	9 8 (BJ)	0 09 (BUJ)	<9 0	18300	3 4 (S)	<4 8 (NR)	82100	<2 0	<1 8	<1 7	2 6
	11/21/96	61100738	filtered	ug/l	162000	8 8 (BJ)	0 05	<9 0	18500	3 0 (SJB)	<4 8 (NR)	81400	<2 0	<1 8	<1 7	
	11/21/96	61100739	filtered	ug/l								81700				
	8/21/97	H7H230120-008	unfiltered	ug/l	128000	56 1	<0 20	3 8 (BUJ)	16200	<3 0	<5 0	82900	4 2 (BUJ)	0 67 (BUJ)	23 8	<10
	11/18/97	H7K190184 012	unfiltered	ug/l	148000	16 5	0 21	3 5 (BJU)	16400	<3 0	<5 0	93600	4 9 (BJU)	<10	11 3 (U)	<10
	2/9/98	H8B100135-003	unfiltered	ug/l	140000	18 2	0 033 (BU)	3 4 (BU)	10800	<5 0	<5 0	66600	3 0 (BU)	<10	8 2 (U)	<10
	5/12/98	H8E150200-012	unfiltered	ug/l	136000	82 2 (J)	<0 20	5 5 (BJU)	13800	<5 0	<5 0	72700 (J)	<10	<10	38 9 (J)	
	12/2/98	H8L030228-018	unfiltered	ug/l	131000	5 0 (BJ)	0 018 (BUJ)	2 0 (BJ)	12700	<5 0	<5 0	75800	<10	<10	14 6 (UJ)	<10
	5/10/99	H9E120206-001	unfiltered	ug/l	118000	15 3	0 062 (BUJ)	2 6 (BJ)	13800	<5 0	<5 0	68900	<10	<10	8 8 (BUJ)	<10
	11/17/99	H9K180309-001	unfiltered	ug/l	83500 (J)	4740	<0 20	9 4 (BUJ)	23100	<5 0	<5 0	97000 (J)	11 2 (U)	5 7 (BJ)	242 (J)	<10
	5/24/00	HOE300151 001	unfiltered	ug/l	80800 (J)	1100 (J)	<0 20	8 6 (BJ)	26300 (J)	<5 0	<5 0	136000 (J)	6 0 (BUJ)	<10	179 (J)	
	11/9/00	HOK100218-001	unfiltered	ug/l	82300	884	<0 20	3 7 (BJ)	19200 (J)	<5 0	<5 0	95600	5 6 (BJU)	<10	41 9	
	5/8/01	H1E100217 001	unfiltered	ug/l	85700	1140 (J)	<0 20	3 1 (BJ)	19400	<5 0	<5 0	144000	<10	<10	44 7	
SW UP	11/29/95	51200061	unfiltered	ug/l	44800	144 (J)	<0 20	<9 1	4980 (B)	<2 0	<5 1	474000 (J)	<2 0 (J)	<3 4	20 9	8 8
	3/20/96	60300683	unfiltered	ug/l	58700	329	0 15 (BU)	<8 2	6320	<2 0	<5 4	577000 (J)	<2 0	<3 9	16 8 (B)	5 1
(SW DUP)	3/20/96	60300684	unfiltered	ug/l	58200	328	0 19 (BU)	<8 2	6710	<2 0 (J)	<5 4	557000 (J)	<2 0	<3 9	16 8 (B)	5
	11/20/96	61100740	unfiltered	ug/l	33900	413	0 42 (*J)	<9 0	5470	<2 0	<4 8	108000	<2 0 (W)	<1 8	14 9 (BJ)	2 5 (*J)
	8/21/97	H7H230120-005	unfiltered	ug/l	23900	51 4 (J)	<0 20	3 6 (BUJ)	2550 (U)	<3 0	<5 0	99400	4 6 (BUJ)	4 1 (BJ)	43 (J)	<10
(SW DUP)	8/21/97	H7H230120-007	unfiltered	ug/l	22900	74 4	<0 20	2 3 (BUJ)	3110	<3 0	<5 0	95600	3 8 (BUJ)	2 3 (BUJ)	82 6	<10
	2/9/98	H8B100135-001	unfiltered	ug/l	49600	113	0 038 (BU)	3 4 (BU)	4630	<5 0	<5 0	330000	4 5 (BU)	<10	27 6 (J)	<10
	11/30/98	H8L030228-004	unfiltered	ug/l	38600	250	<0 20	2 8 (BJ)	4530	<5 0	<5 0	106000	6 3 (BJ)	2 0 (BUJ)	19 5 (UJ)	<10
(SW DUP)	11/30/98	H8L030228-008	unfiltered	ug/l	40000	291	0 015 (BUJ)	3 0 (BJ)	5050	<5 0	<5 0	108000	4 7 (BJ)	2 6 (BUJ)	30 2 (J)	<10
	5/10/99	H9E120206-008	unfiltered	ug/l	48000	127	0 084 (BUJ)	<20 0	4220	<5 0	<5 0	184000	5 2 (BUJ)	1 5 (BUJ)	42 3 (U)	<10
	11/16/99	H9K180309-006	unfiltered	ug/l	26100 (J)	445	<0 20	3 3 (BUJ)	6870	<5 0	<5 0	87200 (J)	4 6 (BUJ)	3 0 (BUJ)	14 0 (BJ)	<10
(SW DUP)	11/16/99	H9K180309-008	unfiltered	ug/l	26200 (J)	455	<0 20	2 4 (BUJ)	6880 (J)	<5 0	<5 0	86400 (J)	6 1 (BUJ)	3 8 (BUJ)	18 0 (BJ)	<10
	5/24/00	HOE300151 028	unfiltered	ug/l	31000 (J)	66 8 (J)	<0 20	<20 0	4170 (J)	<5 0	<5 0	89800 (J)	2 8 (BUJ)	1 2 (BUJ)	4 8 (BJ)	
(SW DUP)	5/24/00	HOE300151 030	unfiltered	ug/l	31200 (J)	68 9 (J)	<0 20	<20 0	4150 (J)	<5 0	<5 0	89800 (J)	4 3 (BUJ)	1 1 (BUJ)	5 1 (BJ)	
SW-DOWN	12/4/95	51200120	unfiltered	ug/l	40700	77 6 (J)	<0 20	<9 1	4160 (B)	<2 0	<5 1	220000 (J)	<2 0	<3 4	18 8 (B)	4 3
(SW DUP)	12/4/95	51200124	unfiltered	ug/l	41100	77 7 (J)	<0 20	<9 1	4160 (B)	<2 0	<5 1	225000 (J)	<2 0	<3 4	16 7 (B)	4 1
	3/20/96	60300679	unfiltered	ug/l	60600	363	0 14 (BU)	<8 2	6530	<2 0	<5 4	611000 (J)	<2 0	<3 9	19 4 (B)	5 1
	11/20/96	61100744	unfiltered	ug/l	35500	361	0 02 (B*UJ)	<9 0	5740	<2 0	<4 8	112000	<2 0	2 1 (BUJ)	15 9 (BJ)	<2 5 (*J)
(SW DUP)	11/20/96	61100745	unfiltered	ug/l	35600	365	0 05 (B*UJ)	<9 0	5760	<2 0 (W)	<4 8	112000	<2 0	2 2 (BUJ)	15 0 (BJ)	<2 5 (*J)
	8/21/97	H7H230120-006	unfiltered	ug/l	24600	53 7 (J)	<0 20	1 4 (BUJ)	2730	<3 0	0 45 (BUJ)	106000	4 5 (BUJ)	1 2 (BUJ)	25 9 (J)	<10
	2/9/98	H8B100135-004	unfiltered	ug/l	51300	109	0 034 (BU)	2 0 (BU)	4690	<5 0	<5 0	317000	5 2 (BU)	1 4 (BJ)	40 9 (J)	<10
(SW DUP)	2/9/98	H8B100135-004	unfiltered	ug/l	51500	109	0 040 (BU)	1 8 (BU)	4700	<5 0	<5 0	319000	<10	<10	22 2 (J)	<10
	11/30/98	H8L030228-008	unfiltered	ug/l	42900	255	0 022 (BUJ)	3 0 (BJ)	5230	<5 0	<5 0	135000	<10	2 0 (BUJ)	25 5 (UJ)	<10
	5/10/99	H9E120206-010	unfiltered	ug/l	49500	122	0 077 (BUJ)	<20 0	5980	<5 0	<5 0	180000	<10	<10	9 9)BUJ)	<10
(SW DUP)	5/10/99	H9E120206-012	unfiltered	ug/l	48500	117	0 076 (BUJ)	<20 0	5790	<5 0	<5 0	176000	<10	1 9 (BUJ)	14 0)BUJ)	<10
	11/16/99	H9K180309-010	unfiltered	ug/l	25100 (J)	230	<0 20	1 4 (BUJ)	6510	<5 0	<5 0	83000 (J)	<10	2 7 (BUJ)	8 5 (BJ)	<10
	5/24/00	HOE300151 032	unfiltered	ug/l	31300 (J)	74 4 (J)	<0 20	<20 0	4160 (J)	3 3 (BJ)	<5 0	90100 (J)	3 2 (BUJ)	1 1 (BUJ)	10 (BJ)	
1988 NR 140 Ground Water Quality Standards	PAL	Not Applicable	ug/l	--	25	0 2	--	--	1	10	--	--	--	2500	40
	ES	Not Applicable	ug/l	--	50	2	--	--	10	50	--	--	--	5000	200
2001 NR 140 Ground Water Quality Standards	PAL	Not Applicable	ug/l	--	25	0 2	20	--	10	10	--	0 4	6	2500	40
	ES	Not Applicable	ug/l	--	50	2	100	--	50	50	--	2	30	5000	200

= Exceeds the PAL (Preventive Action Limit) for **1988**

= Exceeds the ES (Enforcement Standard) for **1988**

197 = Exceeds the PAL (Preventive Action Limit) for **2001**

B- The value listed was detected between the reporting limit and the limit of detection

U Data validation indicates this value is not a qualified detect and is interpreted as no detect

J The value listed is estimated due to minor quality control deviations

Filtering was completed with disposable 0 45 micron filters

METALS (continued)

(Magnesium through Cyanide)

Sample Location	Sample Date	Sample Number	Filtered versus Unfiltered	Units	Magnesuim	Manganese	Mercury	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc	Cyanide
SED UP	11/29/95	51101327	Not Applicable	mg/kg	19400	514	<0 07	18 3	2370	<0 53	<1 3	528 (B)	<0 53 (J)	31 2	58 1 (J)	0 09 (J)
	3/19/96	60300669	Not Applicable	mg/kg	6900	598 (J)	0 04 (B)	25 5	1850	0 60 (BJ)	1 9 (B)	867 (B)	<0 56	42 4	97 1 (J)	0 23
	11/21/96	61100746	Not Applicable	mg/kg	8700	481	0 05 (BUJ)	22 8	2710	<0 61	<1 4	673 (BJ)	<0 61	42 1	81 6	0 13 (*J)
	8/19/97	5660901	Not Applicable	mg/kg	10700	354	<0 14	19 7	954 (BJ)	<0 82 (JN)	<0 65	327 (BJ)	<0 82	21 8	109	<0 68
	2/12/98	5911501	Not Applicable	mg/kg	17900 (J)	890	<0 08	26 6 (J)	1440 (BJ)	<0 27	<1 1	413 (BUJ)	<0 68	30 1	125	<0 86
	11/30/98	H8L030228-001	Not Applicable	mg/kg	6530	298	0 051 (BUJ)	14 3	777 (BJ)	<1 6	<3 1	626 (BUJ)	<3 1	15 3 (BUJ)	70 8 (J)	<3 1 (J)
	5/10/99	H9E120206-005	Not Applicable	mg/kg	5800	451 (J)	<0 17	12 2 (BJ)	836 (BJ)	1 6 (BJ)	<3 4	350 (BJ)	<3 4	22 1	98 0 (J)	<3 4
	11/16/99	H9K180309-003	Not Applicable	mg/kg	3700 (J)	279 (J)	0 083 (BUJ)	9 7 (BJ)	635 (BJ)	<1 5	<3 0	225 (BUJ)	2 2 (BUJ)	20 8	60 7 (J)	<3 0
	11/16/99	H9K180309-004	Not Applicable	mg/kg	5490 (J)	399 (J)	0 079 (BUJ)	14 0	1000 (BJ)	<1 6	<3 1	208 (BUJ)	1 4 (BUJ)	21 7	86 0 (J)	<3 1
	5/24/00	H0E300151-025	Not Applicable	mg/kg	5560	639	0 070 (BJ)	15 6	813 (BJ)	<1 4	<2 8	169 (BJ)	2 3 (BJ)	23 1	82 0 (J)	
(SED-DUP)	5/24/00	H0E300151-026	Not Applicable	mg/kg	5030	1230	0 036 (BJ)	12	435 (BJ)	<1 4	<2 8	170 (BJ)	1 5 (BJ)	23 5	57 2 (J)	
SED DOWN	11/29/95	51101331	Not Applicable	mg/kg	11500	958	<0 08	24 3	3730 (J)	<0 74	<1 8	826 (B)	<0 74	46 4	130 (J)	0 45 (J)
(SED-DUP)	11/29/95	51101332	Not Applicable	mg/kg	10700	1040	<0 08	25	4590 (J)	<0 71	<1 8	903 (B)	<0 71	52 7	127 (J)	0 26 (J)
	3/19/96	60300665	Not Applicable	mg/kg	10500	833 (J)	0 18 (J)	23	2650	<0 69	<1 8	1220 (B)	<0 69 (J)	43 4	129 (J)	0 41
(SED-DUP)	3/19/96	60300670	Not Applicable	mg/kg	8590	815 (J)	0 08 (J)	20 3	2480	<0 63	<1 7	1170 (B)	<0 63	36 6	116 (J)	0 41
	11/21/96	61100750	Not Applicable	mg/kg	9580	602	0 08 (BJ)	18 6	2600	<0 62	<1 6	644 (BJ)	<0 62	35 1	113	0 30 (*J)
(SED-DUP)	11/21/96	61100751	Not Applicable	mg/kg	10100	495	0 07 (BJ)	18 3	2450	<0 60	<1 6	601 (BJ)	<0 60	33 6	114	0 09 (*J)
	8/19/97	5660902	Not Applicable	mg/kg	8230 (J)	704	<0 17	18 7	817 (BJ)	<1 0 (JN)	<0 81	398 (BJ)	<1 0	26 3	105 (J)	<0 85
	8/19/97	5660903	Not Applicable	mg/kg	6040 (J)	654	<0 15	14 1	588 (BJ)	<0 87 (JN)	<0 70	325 (BJ)	<0 87	19 7	68 7 (J)	<0 73
	2/12/98	5911502	Not Applicable	mg/kg	11700 (J)	826	<0 08	19 4 (J)	986 (BJ)	<0 28	<1 1	392 (BJU)	<0 71 (W)	24 3	132	<0 88
(SED DUP)	2/12/98	5911503	Not Applicable	mg/kg	12200 (J)	810	<0 08	20 1 (J)	1110 (BJ)	<0 28	<1 1	369 (BJU)	<0 069 (W	26 8	140	<0 87
	11/30/98	H8L030228-002	Not Applicable	mg/kg	6690	610	0 075 (BUJ)	13 5	755 (BJ)	<1 5	<3 1	594 (BUJ)	<3 1	14 5 (BUJ)	91 3	<3 1 (J)
(SED-DUP)	11/30/98	H8L030228-003	Not Applicable	mg/kg	6990 (J)	583	0 077 (BUJ)	14 2	823 (BJ)	<1 6	<3 2	667 (BJ)	<3 2	16 7 (J)	89 7 (J)	<3 2 (J)
	5/10/99	H9E120206-008	Not Applicable	mg/kg	14700	547 (J)	<0 24	26 2	1760 (BJ)	<2 4	<4 7	666 (BJ)	<4 7	32 2	230	<4 7
(SED-DUP)	5/10/99	H9E120206-007	Not Applicable	mg/kg	13200	582 (J)	<0 24	22 5	1270 (BJ)	<2 4	<4 8	605 (BJ)	<4 8	27 4	208	<4 8
	11/16/99	H9K180309-005	Not Applicable	mg/kg	6080 (J)	530 (J)	0 10 (BUJ)	17,1 (J)	1060 (BJ)	<1 7	<3 4	261 (BUJ)	<3 4	33 2	88 9 (J)	<3 4
	5/24/00	H0E300151-027	Not Applicable	mg/kg	11600	359	0 091 (BJ)	20	1110 (BJ)	<2 0	<4 1	284 (BJ)	1 1 (BJ)	24	180 (J)	
1988 NR 140 Ground Water Quality Standards	PAL	Not Applicable	ug/l	--	25	0 2	--	--	1	10	--	--	--	2500	40
	ES	Not Applicable	ug/l	--	50	2	--	--	10	50	--	--	--	5000	200
2001 NR 140 Ground Water Quality Standards	PAL	Not Applicable	ug/l	--	25	0 2	20	--	10	10	--	0 4	6	2500	40
	ES	Not Applicable	ug/l	--	50	2	100	--	50	50	--	2	30	5000	200

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= Exceeds the ES (Enforcement Standard) for **1988**

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Filtering was completed with disposable 0 45 micron filters